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ABSTRACT

Presented in this document are transcripts of hearings on the subject of national materials policy. The hearings focused on implementation of P.L. 96-479, the National Materials and Minerals Policy, Research and Development Act of 1980 (including the recent Presidential program plan and report made to Congress) and on H.R. 4281, the Critical Materials Act of 1981, introduced last year. Main elements of the National Materials and Minerals Program Plan are outlined. These include stimulation of private sector materials research and development through tax incentives provided by the Economic Recovery Act of 1981, reexamination of wilderness policy, acceleration of review of public lands withdrawn from mineral exploration so that the possible multiple use of these lands can be evaluated, and others. Included is testimony from administration witnesses on the proposed legislation, as well as on the President's program plan and report. Additional testimony includes that provided by witnessess from industry, specifically the steel and aerospace industry, testimony related to the future of advanced ceramics and composites, and testimony from the Federation of Materials Societies and the National Audubon Society on the various issues. (Author/JN)

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OVERSIGHT

PUBLIC LAW 96-479—NATIONAL MATERIALS AND MINERALS POLICY, R. & D. ACT OF 1980 AND CONSIDERATION OF H.R. 4281—CRITICAL MATERIALS ACT OF 1981

HEARINGS

BEFORE THE

SUBCOMMITTEE ON TRANSPORTATION, AVIATION AND MATERIALS

AND THE

SUBCOMMITTEE ON SCIENCE, RESEARCH AND TECHNOLOGY

OF THE

COMMITTEE ON SCIENCE AND TECHNOLOGY U.S. HOUSE OF REPRESENTATIVES

NINETY-SEVENTH CONGRESS

SECOND SESSION

APRIL 20, 22, 1982

[No. 117]

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*On assignment to Budget Committee for 97th Congress.

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OVERSIGHT

Public Law 96-479—National Materials and Minerals Policy, R. & D. Act of 1980 and Consideration of H.R. 4281—Critical Materials Act of 1981

TUESDAY APRIL 20, 1982

HOUSE OF REPRESENTATIVES, COMMITTEE ON SCIENCE AND TECHNOLOGY, SUBCOMMITTEE ON TRANSPORTATION, AVIATION AND MATERIALS, AND SUBCOMMITTEE ON SCIENCE, RESEARCH AND TECHNOLOGY,

Washington, D.C.

The subcommittees met, pursuant to call, at 9 a.m., in room 2318, Rayburn House Office Building, Hon. Dan Glickman (chairman of the Subcommittee on Transportation, Aviation and Materials) presiding.

[The prepared opening statement of Mr. Glickman follows:]

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OPENING STATEMENT
HONORABLE DAN GLICKMAN, CHAIRMAN
SUBCOMMITTEE ON TRANSPORTATION, AVIATION AND MATERIALS

HEARINGS ON H.R. 4281
CRITICAL MATERIALS ACT OF 1981

TODAY, THE SUBCOMMITTEE ON TRANSPORTATION, AVIATION AND MATERIALS, TOGETHER WITH THE SUBCOMMITTEE ON SCIENCE, RESEARCH AND TECHNOLOGY, CHAIRED BY MY COLLEAGUE FROM PENNSYLVANIA, THE HONORABLE DOUG WALGREN, IS HOLDING TWO DAYS OF JOINT HEARINGS ON THE SUBJECT OF NATIONAL MATERIALS POLICY. THE HEARINGS ARE TWO-FOLD. FIRST, WE WILL BE CONSIDERING THE IMPLEMENTATION OF P.L. 96-479, THE NATIONAL MATERIALS AND MINERALS POLICY, RESEARCH AND DEVELOPMENT ACT OF 1980, INCLUDNG THE RECENT PRESIDENTIAL PROGRAM PLAN AND REPORT MADE TO CONGRESS. SECONDLY, WE WILL FOCUS OUR ATTENTION ON H.R. 4281, THE CRITICAL MATERIALS ACT OF 1981, INTRODUCED LAST YEAR.

ON APRIL 5TH, AFTER ALMOST SIX MONTH'S DELAY, THE PRESIDENT RELEASED THE NATIONAL MATERIALS AND MINERALS PROGRAM PLAN AND REPORT TO CONGRESS. THAT PLAN FOCUSES PRIMARILY ON MINERALS AND MINING WHICH MISSES, AS I HAVE RECENTLY SAID, A MAJOR PART OF THE MATERIALS CYCLE -- THAT OF THE CONSUMER AND PRODUCT USER SUCH AS INDUSTRY, DEFENSE OR THE PUBLIC AT LARGE. FURTHER, MATERIALS RESEARCH AND DEVELOPMENT ACTIVITIES FOR SUCH INDUSTRIES AS AEROSPACE OR THE AUTOMOTIVE INDUSTRY ARE CREATING ENTIRELY NEW MATERIALS SUCH AS CERAMICS AND COMPOSITES. THESE COULD WELL CHANGE THE NATURE OF THE NATION'S CRITICAL MATERIALS NEEDS OF THE FUTURE. I'M VERY MUCH INTERESTED IN HEARING HOW THIS ADMINISTRATION WILL DEAL WITH THESE BROADER ISSUES.

H.R. 4281, THE CRITICAL MATERIALS ACT OF 1981, IS SEEN BY THIS COMMITTEE AS A POSSIBLE NEXT STEP IN IMPLEMENTING A NATIONAL MATERIALS POLICY. I THINK WE ARE ALL IN AGREEMENT AS TO THE NEED FOR HIGH LEVEL COORDINATION OF MATERIALS POLICY AND RELATED PROGRAMS. WE APPEAR TO BE IN DISAGREEMENT AS TO WHO SHOULD COORDINATE THIS POLICY. P.L. 96-479 CALLS FOR COORDINATION TO TAKE PLACE AT THE LEVEL OF THE PRESIDENT'S EXECUTIVE OFFICE; A SUB-CABINET COUNCIL HAS BEEN DESIGNATED BY THIS ADMINISTRATION WITH THAT RESPONSIBILITY. THE FACT THAT THE REPORT IS SIX MONTH'S LATE IN ARRIVING IS SUFFICIENT TO UNDERSCORE OUR CONCERN FOR THE EFFICIENCY OF SUCH POLICY ORGANIZATIONAL STRUCTURE.

I'M LOOKING FORWARD TO HEARING OUR WITNESSES TODAY AND ON THURSDAY TO ADDRESS THESE AND OTHER QUESTIONS.

Mr. GLICKMAN. Good morning. Today the hearing will officially begin.

Today, the Subcommittee on Transportation, Aviation and Materials, which I chair, and the Subcommittee on Science, Research and Technology, chaired by my colleague from Pennsylvania, the Honorable Doug Walgren, is holding 2 days of joint hearings on the subject of national materials policy. The hearings are twofold. First, we will be considering the implementation of Public Law 96-479, the National Materials and Minerals Policy, Research and Development Act of 1980, including the recent Presidential program and report made to Congress pursuant to that act. Second, we will focus our attention on H.R. 4281, the Critical Materials Act of 1981, introduced last year.

On April 5, after almost 6 months' delay, the President released the national materials and minerals program plan and report to Congress. That plan focuses primarily on minerals and mining which misses, as I have recently said, a major part of the materials cycle—that of the consumer and product user such as industry, defense, or the public at large. Further, materials research and development activities for such industries as aerospace or the automotive industry are creating entirely new materials such as ceramics and composites. These could well change the nature of the Nation's critical materials needs of the future. I am very much interested in hearing how this administration will deal with these broader issues.

H.R. 4281, the Critical Materials Act of 1981, is seen by this committee as a possible next step in implementing a national materials policy. I think we are all in agreement as to the need for high-level coordination of materials policy and related programs. We appear to be in disagreement, however, as to who should coordinate this

policy. Public Law 96-479 calls for coordination to take place at the level of the President's Executive Office; a sub-Cabinet council has been designated by this administration with that responsibility. The fact that this report is 6 months late in arriving is sufficient to underscore our concern for the efficiency of such policy organizational structure.

I might add parenthetically that, as a practical matter, where this takes place is important because of the significance of the issues related thereby. We are not arguing bureaucratic or organizational charts just because we think they are cute. It is only because we think that there is some great significance in terms of who coordinates materials policy for the future of this country.

I am looking forward to hearing our witnesses today and on Thursday to address these and other concerns. I know that there may be some other statements for the record by the minority or anybody else, and they will be included in the record at this point.

Mr. GLICKMAN. We have a panel today. Mr. Richard Donnelly, Director of Industry Resources of the Department of Defense, I know has to testify in the Senate. We will let him testify first and then, after he leaves, I believe that you said that somebody (Mr. Kenneth Foster) from DOD will come forward and sit in your place.

Then we will go with Mr. John Marcum, Mr. Robert Wilson, and Mr. William Pendley.

Mr. Donnelly, why don't you proceed?

[The biographical sketch of Mr. Wilson follows:]

STATEMENTS OF RICHARD DONNELLY, DIRECTOR OF INDUSTRY RESOURCES, DEPARTMENT OF DEFENSE, ACCOMPANIED BY KENNETH R. FOSTER, STAFF DIRECTOR FOR MATERIALS POLICY, DEPARTMENT OF DEFENSE, AND JEROME PERSH, STAFF SPECIALIST ON MATERIALS AND STRUCTURES, DEPARTMENT OF DEFENSE; JOHN M. MARCUM, ASSISTANT TO THE DIRECTOR FOR ENERGY AND NATURAL RESOURCES, OFFICE OF SCIENCE AND TECHNOLOGY POLICY; ROBERT WILSON, OFFICE OF STRATEGIC RESOURCES, DEPARTMENT OF COMMERCE; DEPARTMENT OF DEFENSE; AND WILLIAM P. PENDLEY, DEPUTY ASSISTANT SECRETARY FOR ENERGY AND MINERALS, DEPARTMENT OF INTERIOR

Mr. DONNELLY. Thank you, Mr. Chairman.

Before beginning, I would like to introduce Mr. Jerome Persh and Mr. Kenneth Foster of our office who will be here to help us.

I appreciate this opportunity to appear before you today to discuss the status of the actions required of the Department of Defense under the National Materials and Minerals Policy, Research and Development Act of 1980, Public Law 96–479, and our posture regarding the Critical Materials Act of 1981, H.R. 4281.

To provide some perspective, I must carefully point out that the DOD is a consumer of finished weapon systems and equipment. We are a small consumer in the overall U.S. marketplace and generally do not directly procure raw materials. We are, however, keenly aware of the relationship of materials to the national security and the interest in present and potential materials policies affecting the U.S. industrial structure.

Because of these reasons, the Department of Defense is continuing to move ahead smartly with the implementation of actions which fulfill the spirit of the National Materials Policy Act of 1980.

While the President's national materials and minerals program plan and report to the Congress addresses a broad spectrum of Federal agency responsibilities, I will address only those relating to Department of Defense mission responsibilities.

Before proceeding, however, let me review several of the actions we have previously reported on and provide some commentary on their future course. The actions we have taken are:

One, assigned senior members of the Secretary of Defense staff, representing both the industrial resources and the research and development organizational elements, to continue the Department's responsibilities under the act. This team will continue to fulfill this function and work closely with assigned counterparts in the Departments of Commerce, Interior and State, the Central Intelli-

gence Agency, the National Security Council, the Federal Emergency Management Agency, the Office of Science and Technology policy, and other concerned Federal groups, as well as industry and academia.

Two, secured the continuing support of the Institute for Defense Analyses to assist us in assessing the overall materials, minerals, and research and development situation and in developing policy option impact appraisals for our review. This continuing effort includes careful analysis of materials technology and production options available to the Department of Defense to improve supply and production aspects related to strategic and critical materials involving domestic industries. These include composites, titanium, natural rubber, germanium, cobalt, platinum, manganese, chromium, and others.

Three, participated in several working groups of the Cabinet Council on Natural Resources and Environment to development the administration's response to Public Law 96-479.

The President's National Materials and Minerals program plan and report to Congress endorses the role of research and development as one of the important options to diminish the materials and minerals vulnerability of the United States. This policy statement is a strong affirmation of the Department of Defense directions along these lines first outlined by Dr. Arden Bement, who was then Deputy Under Secretary of Defense for Research and Engineering (Research and Advanced Technology) in his testimony before both the House and Senate Armed Services Committees in March of 1980. In this statement, Dr. Bement said,

> In fiscal year 1981, with our growing dependence on foreign sources for raw materials, greater emphasis will be placed on substitution and conservation. We will stress technology to achieve more independence in the areas of strategic and critical materials.

This statement by Dr. Bement stimulated the Under Secretary of Defense for Research and Engineering to issue policy guidance to the military departments and defense agencies to consider materials substitution in the planning of their research and development programs. The Defense Science Board, in their 1980 study on industrial responsiveness, further reinforced our posture along these lines. The enactment of the National Materials and Minerals Policy, Research and Development Act of 1980 (Public Law 96-479) lent additional impetus to our efforts. As Mr. Robert Trimble, then acting Deputy Under Secretary of Defense for Research and Engineering (Acquisition policy), reported at hearings before these committees in March and July of last year, we had initiated and completed a proposed "DOD-wide research and development plan for satisfying DOD critical and strategic materials requirements."

Because of the mission relevance of practically our entire R. & D. program, we have only a relatively modest program precisely directed at the development of direct substitutes for strategic and critical materials. However, a major portion of the ongoing military performance oriented materials and structures R. & D. programs has, in accordance with policy, been planned to strongly consider the direct substitution option while still fulfilling our mission needs.

For example, our vast materials composites program (organic, metal and carbon matrix composites) which will develop direct substitutes and production decision options for several critical and strategic materials, is currently funded at a level of about $80 million in fiscal year 1982. This represents about one-third of the total DOD materials and structures program.

Furthermore, a substantial portion of the DOD Rapid Solidification Technology program, which is currently funded at a level of about $24 million in fiscal year 1982, will be developing superalloy and other materials which will use lower fractions of strategic elements and display appreciable performance benefits. Overall, about 30 percent of our total ongoing materials and structures research and development program will be developing new materials which have significant potential in an emergency situation to be used as substitutes for certain critical and strategic materials in the production of essential weapon systems.

Our thrust along these lines was given added encouragement by enactment of the fiscal year 1982 Department of Defense appropriations bill which included $1 million for additional research and development in metal-matrix and carbon/carbon composite materials to address the substitutes option for specific military applications.

The President's statement also encourages the coordination of international materials research and development activities with the European community and other free world countries. We have for a number of years participated with the North Atlantic Treaty Organization Advisory Group on Aeronautical Research and Development and the Defense Group in their materials and structures exchanges.

Furthermore, the Military Technical Cooperation program, which includes participation by the United Kingdom, Canada, Australia, New Zealand, and ourselves, which has been in existence since 1957, has a subgroup precisely directed at materials technology. In addition to these formal agreements involving multiple free world country exchanges, we have a series of defense related specific topical area bilateral information exchanges programs, data exchange agreements, memoranda of understanding, and the like, with countries such as the United Kingdom, Australia, and France. We, therefore, are in full accord with the administration's stated policy.

The President's national materials and minerals policy statement further reaffirms the Committee on Materials, COMAT, under the direction of the Federal Coordinating Council on Science, Engineering and Technology, for the coordination of Federal materials and minerals research and development. Within this policy guidance, the Cabinet Council on Natural Resources and Environment is given responsibility for policy resolution of issues which may arise. It further transfers the responsibility for the Materials Availability Steering Committee, which the Department of Defense had chaired since 1973, to the COMAT. We will include industrial base considerations in this effort. We endorse these actions and affirm that they are fully supportive of the spirit and intent of H.R. 4281, the Critical Materials Act of 1981.

As a broad synopsis of the findings of the Department of Defense resulting from our work under Public Law 96-479, it is clear that the path between the research and engineering, the raw materials, and the finished defense product is different for each of the materials we have studied. The complete processing cycle must be carefully examined on an individual basis. The first major effort along these lines that we have assigned to the Institute for Defense Analyses is in the areas of titanium, cobalt, manganese, chromium and composite materials because of our heavy production commitment to the use of those materials for a wide variety of military equipment.

In addition, we believe that:

One, coordination by the administration of strategic and critical materials coordination at the highest levels of the government will serve to appreciably improve our defense posture.

Two, strong support for defense related materials research and development and manufacturing technology programs offer a strong potential for reducing our overseas dependence for strategic and critical materials.

Three, the Defense Production Act and the Strategic and Critical Materials Stockpiling Acts are both fundamentally sound. The Defense Production Act should be extended for 5 years without amendment.

In conclusion, the Department of Defense remains concerned with the U.S. capability for industrial expansion to meet emergency requirements. We still have a long way to go to improve industrial preparedness for potential surge and national emergency scenarios. The domestic industrial base production capabilities associated with industrial preparedness, including the identified materials and processes required, must continue to be carefully and continually examined, particularly in high defense use areas and rapidly changing technology situations.

This completes my prepared statement. I will be pleased to answer any questions the committee members may have.

Mr. GLICKMAN. Mr. Donnelly, who will be taking your place?

Mr. DONNELLY. Mr. Kenneth R. Foster, who is staff director for materials policy in my office.

I will be here for a little while longer.

Mr. GLICKMAN. We are going to go through each witness, and we will see how long you are able to be here.

[The prepared statement of Mr. Donnelly follows:]

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STATEMENT

BY

MR. RICHARD E. DONNELLY
DIRECTOR (INDUSTRIAL RESOURCES)
OFFICE OF THE DEPUTY UNDER
SECRETARY FOR RESEARCH AND
ENGINEERING (ACQUISITION MANAGEMENT)

BEFORE THE
SUBCOMMITTEE ON SCIENCE, RESEARCH,
AND TECHNOLOGY

AND THE
SUBCOMMITTEE ON TRANSPORTATION,
AVIATION AND MATERIALS
COMMITTEE ON SCIENCE AND TECHNOLOGY
UNITED STATES HOUSE OF
REPRESENTATIVES

20 APRIL 1982

STATEMENT

COMMITTEE ON SCIENCE AND TECHNOLOGY
UNITED STATES HOUSE OF REPRESENTATIVES

20 APRIL 1982

Mr. Chairman and Members of the Subcommittees:

I appreciate this opportunity to appear before you today to discuss the status of the actions required of the Department of Defense under the National Materials and Minerals Policy, Research and Development Act of 1980, Public Law 96-479 and our posture regarding the Critical Materials Act of 1981, (H.R. 4281).

To provide some perspective, I must carefully point out that the DoD is a consumer of finished weapon systems and equipment. We are a small consumer in the overall U.S. market place and generally do not directly procure raw materials. We are, however, keenly aware of the relationship of materials to the national security and the interest in present and potential materials policies affecting the U.S. industrial structure.

Because of these reasons, the Department of Defense is continuing to move ahead smartly with the implementation of actions which fulfill the spirit of The National Materials Policy Act of 1980.

WHILE THE PRESIDENTS' NATIONAL MATERIALS AND MINERALS PROGRAM PLAN AND REPORT TO THE CONGRESS ADDRESSES A BROAD SPECTRUM OF FEDERAL AGENCY RESPONSIBILITIES, I WILL ADDRESS ONLY THOSE RELATING TO DEPARTMENT OF DEFENSE MISSION RESPONSIBILITIES.

BEFORE PROCEEDING, HOWEVER, LET ME REVIEW SEVERAL OF THE ACTIONS WE HAVE PREVIOUSLY REPORTED ON AND PROVIDE SOME COMMENTARY ON THEIR FUTURE COURSE. THE ACTIONS WE HAVE TAKEN ARE:

1. ASSIGNED SENIOR MEMBERS OF THE SECRETARY OF DEFENSE STAFF, REPRESENTING BOTH THE INDUSTRIAL RESOURCES AND THE RESEARCH AND DEVELOPMENT ORGANIZATIONAL ELEMENTS, TO CONTINUE THE DEPARTMENTS' RESPONSIBILITIES UNDER THE ACT. THIS TEAM WILL CONTINUE TO FULFILL THIS FUNCTION AND WORK CLOSELY WITH ASSIGNED COUNTERPARTS IN THE DEPARTMENTS OF COMMERCE, INTERIOR AND STATE, THE CENTRAL INTELLIGENCE AGENCY, THE NATIONAL SECURITY COUNCIL, THE FEDERAL EMERGENCY MANAGEMENT AGENCY, THE OFFICE OF SCIENCE AND TECHNOLOGY POLICY, AND OTHER CONCERNED FEDERAL GROUPS AS WELL AS INDUSTRY AND ACADEMIA.

2. SECURED THE CONTINUING SUPPORT OF THE INSTITUTE FOR DEFENSE ANALYSES TO ASSIST US IN ASSESSING THE OVERALL MATERIALS, MINERALS, AND RESEARCH AND DEVELOPMENT SITUATION AND IN DEVELOPING POLICY OPTION IMPACT APPRAISALS FOR OUR REVIEW. THIS CONTINUING EFFORT

INCLUDES CAREFUL ANALYSIS OF MATERIALS TECHNOLOGY AND PRODUCTION OPTIONS AVAILABLE TO THE DEPARTMENT OF DEFENSE TO IMPROVE SUPPLY AND PRODUCTION ASPECTS RELATED TO STRATEGIC AND CRITICAL MATERIALS INVOLVING DOMESTIC INDUSTRIES. THESE INCLUDE COMPOSITES, TITANIUM, NATURAL RUBBER, GERMANIUM, COBALT, PLATINUM, MANGANESE AND CHROMIUM AND OTHERS.

3. PARTICIPATED IN SEVERAL WORKING GROUPS OF THE CABINET COUNCIL ON NATURAL RESOURCES AND ENVIRONMENT TO DEVELOP THE ADMINISTRATION'S RESPONSE TO PUBLIC LAW 96-479.

THE PRESIDENT'S NATIONAL MATERIALS AND MINERALS PROGRAM PLAN AND REPORT TO CONGRESS ENDORSES THE ROLE OF RESEARCH AND DEVELOPMENT AS ONE OF THE IMPORTANT OPTIONS TO DIMINISH THE MATERIALS AND MINERALS VULNERABILITY OF THE UNITED STATES. THIS POLICY STATEMENT IS AN STRONG AFFIRMATION OF THE DEPARTMENT OF DEFENSE DIRECTIONS ALONG THESE LINES FIRST OUTLINED BY DR. ARDEN BEMENT, WHO WAS THEN DEPUTY UNDER SECRETARY OF DEFENSE FOR RESEARCH AND ENGINEERING (RESEARCH AND ADVANCED TECHNOLOGY) IN HIS TESTIMONY BEFORE BOTH THE HOUSE AND SENATE ARMED SERVICES COMMITTEES IN MARCH 1980. IN THIS STATEMENT, DR. BEMENT SAID "IN FISCAL YEAR 1981, WITH OUR GROWING DEPENDENCE ON FOREIGN SOURCES FOR RAW MATERIALS, GREATER EMPHASIS WILL BE PLACED ON SUBSTITUTION AND CONSERVATION. WE WILL STRESS TECHNOLOGY TO ACHIEVE MORE INDEPENDENCE IN THE AREAS OF STRATEGIC AND CRITICAL MATERIALS."

THIS STATEMENT BY DR. BREMENT STIMULATED THE UNDER SECRETARY OF DEFENSE RESEARCH AND ENGINEERING TO ISSUE POLICY GUIDANCE TO THE MILITARY DEPARTMENTS AND DEFENSE AGENCIES TO CONSIDER MATERIALS SUBSTITUTION IN THE PLANNING OF THEIR RESEARCH AND DEVELOPMENT PROGRAMS. THE DEFENSE SCIENCE BOARD, IN THEIR 1980 STUDY ON INDUSTRIAL RESPONSIVENESS FURTHER REINFORCED OUR POSTURE ALONG THESE LINES. THE ENACTMENT OF THE NATIONAL MATERIALS AND MINERALS POLICY, RESEARCH AND DEVELOPMENT ACT OF 1980 (PUBLIC LAW 96-479) LENT ADDITIONAL IMPETUS TO OUR EFFORTS. AS MR. ROBERT TRIMBLE, THEN ACTING DEPUTY UNDER SECRETARY OF DEFENSE FOR RESEARCH AND ENGINEERING (ACQUISITION POLICY), REPORTED AT HEARINGS BEFORE THESE COMMITTEES IN MARCH AND JULY OF LAST YEAR, WE HAD INITIATED AND COMPLETED A PROPOSED "DoD-WIDE RESEARCH AND DEVELOPMENT PLAN FOR SATISFYING DoD CRITICAL AND STRATEGIC MATERIALS REQUIREMENTS"

BECAUSE OF THE MISSION RELEVANCE OF PRACTICALLY OUR ENTIRE R&D PROGRAM WE HAVE ONLY A RELATIVELY MODEST PROGRAM PRECISELY DIRECTED AT THE DEVELOPMENT OF DIRECT SUBSTITUTES FOR STRATEGIC AND CRITICAL MATERIALS, HOWEVER, A MAJOR PORTION OF THE ONGOING MILITARY PERFORMANCE ORIENTED MATERIALS AND STRUCTURES R&D PROGRAM HAS, IN ACCORDANCE WITH POLICY, BEEN PLANNNED TO STRONGLY CONSIDER THE DIRECT SUBSTITUTION OPTION WHILE STILL FULFILLING OUR MISSION NEEDS. FOR EXAMPLE, OUR VAST MATERIALS COMPOSITES PROGRAM (ORGANIC, METAL, AND CARBON MATRIX COMPOSITES) WHICH WILL DEVELOP DIRECT SUBSTITUTES

AND PRODUCTION DECISION OPTIONS FOR SEVERAL CRITICAL AND STRATEGIC MATERIALS, IS CURRENTLY FUNDED AT A LEVEL OF ABOUT $80M IN FY 1982. THIS REPRESENTS ABOUT ONE THIRD OF THE TOTAL DoD MATERIALS AND STRUCTURES PROGRAM. FURTHERMORE, A SUBSTANTIAL PORTION OF THE DoD RAPID SOLIDIFICATION TECHNOLOGY PROGRAM, WHICH IS CURRENTLY FUNDED AT A LEVEL OF ABOUT $24M IN FY 1982 WILL BE DEVELOPING SUPERALLOY AND OTHER MATERIALS WHICH WILL USE LOWER FRACTIONS OF STRATEGIC ELEMENTS AND DISPLAY APPRECIABLE PERFORMANCE BENEFITS. OVERALL, ABOUT THIRTY PERCENT OF OUR TOTAL ON-GOING MATERIALS AND STRUCTURES RESEARCH AND DEVELOPMENT PROGRAM WILL BE DEVELOPING NEW MATERIALS WHICH HAVE SIGNIFICANT POTENTIAL, IN AN EMERGENCY SITUATION, TO BE USED AS SUBSTITUTES FOR CERTAIN CRITICAL AND STRATEGIC MATERIALS IN THE PRODUCTION OF ESSENTIAL WEAPON SYSTEMS.

OUR THRUST ALONG THESE LINES WAS GIVEN ADDED ENCOURAGEMENT BY ENACTMENT OF THE FISCAL YEAR 1982 DEPARTMENT OF DEFENSE APPROPRIATIONS BILL WHICH INCLUDED $1M FOR ADDITIONAL RESEARCH AND DEVELOPMENT IN METAL-MATRIX AND CARBON/CARBON COMPOSITE MATERIALS TO ADDRESS THE SUBSTITUTES OPTION FOR SPECIFIC MILITARY APPLICATIONS.

THE PRESIDENTS' STATEMENT ALSO ENCOURAGES THE STIMULATION OF INTERNATIONAL MATERIALS RESEARCH AND DEVELOPMENT ACTIVITIES WITH THE EUROPEAN COMMUNITY AND OTHER FREE WORLD COUNTRIES. WE HAVE, FOR A NUMBER OF YEARS, PARTICIPATED WITH THE NORTH

Atlantic Treaty Organization Advisory Group on Aeronautical Research and Development and the Defense Research Group in their materials and structures exchanges. Furthermore, the Military Technical Cooperation Program, which includes participation by the United Kingdom, Canada, Australia and New Zealand, and ourselves, which has been in existence since 1957, has a Subgroup precisely directed at Materials Technology. In addition to these formal agreements involving multiple free-world country exchanges, we have a series of defense related specific topical area bi-lateral Information Exchanges Programs, Data Exchange Agreements, Memoranda of Understanding, and the like, with countries such as the United Kingdom, Australia, and France. We therefore are in full accord with the Administrations' stated policy.

The President's National Materials and Minerials Policy statement further reaffirms the Committee on Materials (COMAT) under the direction of the Federal Coordinating Council on Science, Engineering, and Technology for the coordination of federal materials and minerals research and development. Within this policy guidance, the Cabinet Council on Natural Resources and Environment is given responsibility for policy resolution of issues which may arise. It further transfers the responsibility for the Materials Availability Steering Committee which the Department of Defense has chaired since 1973, to the COMAT. We will include industrial base considerations in this effort. We endorse these actions and affirm that they are fully supportive

OF THE SPIRIT AND INTENT OF H.R. 4281 "CRITICAL MATERIALS ACT OF 1981."

AS A BROAD SYNOPSIS OF THE FINDINGS OF THE DEPARTMENT OF DEFENSE RESULTING FROM OUR WORK UNDER PUBLIC LAW 96-479, IT IS CLEAR THAT THE PATH BETWEEN THE RESEARCH AND ENGINEERING, THE RAW MATERIALS AND THE FINISHED DEFENSE PRODUCT IS DIFFERENT FOR EACH OF THE MATERIALS WE HAVE STUDIED. THE COMPLETE PROCESSING CYCLE MUST BE CAREFULLY EXAMINED ON AN INDIVIDUAL BASIS. THE FIRST MAJOR EFFORT ALONG THESE LINES THAT WE HAVE ASSIGNED TO THE INSTITUTE FOR DEFENSE ANALYSES IS IN THE AREAS OF TITANIUM, COBALT, MANGANESE, CHROMIUM, AND COMPOSITE MATERIALS BECAUSE OF OUR HEAVY PRODUCTION COMMITTMENT TO THE USE OF THOSE MATERIALS FOR A WIDE VARIETY OF MILITARY EQUIPMENT.

IN ADDITION, WE BELIEVE THAT:

1. STIMULATION BY THE ADMINISTRATION OF STRATEGIC AND CRITICAL MATERIALS COORDINATION AT THE HIGHEST LEVELS OF THE GOVERNMENT WILL SERVE TO APPRECIABLY IMPROVE OUR DEFENSE POSTURE;

2. STRONG SUPPORT FOR MATERIALS RESEARCH AND DEVELOPMENT AND MANUFACTURING TECHNOLOGY PROGRAMS OFFER A STRONG POTENTIAL FOR REDUCING OUR OVERSEAS DEPENDENCY FOR STRATEGIC AND CRITICAL MATERIALS; AND

3. THE DEFENSE PRODUCTION ACT AND THE STRATEGIC AND CRITICAL MATERIALS STOCKPILING ACTS ARE BOTH FUNDAMENTALLY SOUND BUT REQUIRE SOME MODIFICATION AND IMPROVEMENT IN IMPLEMENTATION.

IN CONCLUSION, THE DEPARTMENT OF DEFENSE REMAINS CONCERNED WITH THE U.S. CAPABILITY FOR INDUSTRIAL EXPANSION TO MEET EMERGENCY REQUIREMENTS. WE STILL HAVE A LONG WAY TO GO TO IMPROVE INDUSTRIAL PREPAREDNESS FOR POTENTIAL SURGE AND NATIONAL EMERGENCY SCENARIOS. THE DOMESTIC INDUSTRIAL BASE PRODUCTION CAPABILITIES ASSOCIATED WITH INDUSTRIAL PREPAREDNESS, INCLUDING THE IDENTIFIED MATERIALS AND PROCESSES REQUIRED, MUST CONTINUE TO BE CAREFULLY, AND CONTINUALLY EXAMINED, PARTICULARLY IN HIGH DEFENSE USE AREAS AND RAPIDLY CHANGING TECHNOLOGICAL SITUATIONS.

THIS COMPLETES MY PREPARED STATEMENT. I WILL BE PLEASED TO ANSWER ANY QUESTIONS THE COMMITTEE MEMBERS MAY HAVE.

Mr. GLICKMAN. Our next witness is Mr. John Marcum with OSTP. It is a pleasure to have you here.

I would like to say that, although most of your statements are fairly short, your entire statements will appear in the record. So, if you wanted to summarize, that would be fine with the committee. You may proceed.

Mr. MARCUM. Thank you, Chairman Glickman and members of the committee. I am pleased to be here today to discuss the proposed "Critical Materials Act of 1981," as well as the "National Materials and Minerals Program Plan and Report to Congress," which the President recently transmitted to you.

The President's Science Advisor, Dr. Keyworth, has asked me to emphasize the importance he and the administration place on minerals and materials policy. OSTP has participated fully in the development of the plan which you recently received, particularly in its research and development portions, and we consider this our submission as required under the National Materials and Minerals Policy, Research and Development Act of 1980.

We are pleased with the recently issued plan, and feel that it will be effective in addressing national minerals and materials needs.

I know you will be happy to hear that I intend to be brief today, and address the proposed "Critical Materials Act of 1981," in light of the focus that the administration's program plan brings. I would like to start by expressing appreciation to Chairman Fuqua and

yourself, as well as the other cosponsors of the bill, for recognizing the importance of addressing the need for high-level coordination of the many materials and minerals activities within the Federal Government. OSTP shares this concern, as I am sure my fellow panel members do also.

This administration is committed to dealing with the increasing dependence of the United States and the free world upon foreign sources for strategic and critical materials. The National Materials and Minerals program plan and report to Congress sets forth the policy, priorities and coordinating structure to deal with the many parts of this issue. Let me briefly discuss what has been done and what is planned to address this issue.

The Cabinet Council on Natural Resources and Environment, made up of Cabinet officers and chaired in the absence of the President by the Secretary of the Interior, produced the National Materials and Minerals program plan and report to Congress. The Cabinet Council provides an excellent minerals and materials policy review mechanism for a number of reasons: insures high-level consideration of important materials policy issues on a timely basis; provides for prompt action on such issues by the President; and the Cabinet Council requires minimum administrative staff, relying for detailed analysis upon the various agencies and departments which have ultimate statutory responsibility for implementation.

Following completion of the Cabinet Council program plan, the President reviewed and transmitted it to the Congress. In his message, the President emphasized the critical role of minerals and materials to our economy, national defense, and standard of living. He also focused attention on the need for the Federal Government to redirect its materials R. & D. effort on long-term, high potential payoff activities of wide generic application to improve and augment domestically available materials. In closing, the President expressed that this policy is responsive to America's need for measures to diminish minerals vulnerability by allowing private enterprise to preserve and expand our minerals and materials economy.

Under the plan, the administration will continue its review and reform of excessively burdensome or unnecessary regulations and statutes which adversely affect the domestic minerals industry. More cost effective approaches are being considered for mine safety, noise standards, lead standards, and others. Administrative reforms such as streamlining the process of recording unpatented claims are in progress. Land access regulations, Clean Air Act, Clean Water Act are all being reviewed for cost efficiency and adequacy.

Materials stockpile policy is effectively addressed. This administration has undertaken the first stockpile purchase program in 20 years. In fiscal year 1981, the Congress provided $100 million for acquisition under this program, and the President requested an additional $106 million for fiscal year 1982, which is currently limited, however, by resolution to $57.6 million. This administration will streamline the stockpile planning process through 5-year planning guidance for GSA acquisitions and disposals, and through a fiscal year plan that matches annual budget ceilings, market conditions, immediate strategic requirements, and GSA purchase activities.

In the area of mining and materials R. & D., the administration has previously provided important new tax incentives in the Economic Recovery and Tax Act which should stimulate private research and development and is also reviewing patent policy with similar objectives in mind.

OSTP, in concert with each department and agency, has been specifically tasked to direct senior officials in the applicable agencies to maintain or create effective mechanisms for constructive coordination of this R. & D. policy. Any government financed R. & D. activities will concentrate on long-term, high-risk, potentially high payoff projects with the best chance for wide generic application. This should give the taxpayer a better payoff for the investment, a bigger "bang for the buck."

Coordination of R. & D. activities has been assigned in the plan to the Federal Coordinating Council for Science, Engineering, and Technology, which we refer to as FCCSET. This committee is chaired by Dr. Keyworth. The plan endorses also the previously established Committee on Materials, COMAT, an interagency working group of the FCCSET, and directs that the COMAT will have:

Assistant Secretary-level representation from the departments and agencies concerned with minerals and materials.

Placement within COMAT of the Department of Defense Material Availability Steering Committee, as my colleague mentioned earlier, and the Interagency Materials Group.

Establishment of a Working Panel within COMAT to coordinate Federal research and development on essential materials.

Establishment of a formal mechanism within Comat for information exchange between agency materials research and development program managers; and,

Policy resolution of materials research and development questions will be provided through the Cabinet Council on Natural Resources and Environment. That was addressed earlier.

I feel confident that we have the mechanisms in place to effectively coordinate materials and minerals issues. As you know, the administration's program plan was issued on April 5, 1982, and we have not yet had sufficient time to implement it. We have a meeting of the FCCSET scheduled in May to coordinate plans for implementation of our new policy.

Although fully endorsing the need for effective materials and minerals policy coordination, we feel that the Presidential Commission called for in H.R. 4281 would present an unnecessary additional bureaucratic structure that would cause inefficiency and delay in materials and minerals policy coordination. It is important to maintain the policy coordination structure closely related to the agencies and departments which have ultimate statutory responsibility for implementation. A new organization or commission would add an unnecessary layer of bureaucracy and dilute agency involvement in policy implementation. The structure now in place should accomplish the needed coordination to implement materials and minerals policy.

Thank you for this opportunity to testify on this most important matter. I will be glad to answer any questions you may have.

[The prepared statement of Mr. Marcum follows:]

STATEMENT BY JOHN M. MARCUM
OF THE OFFICE OF SCIENCE AND TECHNOLOGY POLICY
BEFORE THE
SUBCOMMITTEE ON SCIENCE, RESEARCH AND TECHNOLOGY
AND THE
SUBCOMMITTEE ON TRANSPORTATION, AVIATION AND MATERIALS

April 20, 1982

Chairman Walgren, Chairman Glickman, and Members of the Committee: I am pleased to be here today to discuss the proposed "Critical Materials Act of 1981," as well as the "National Materials and Minerals Program Plan and Report to Congress," which the President has recently transmitted to you.

The President's Science Advisor, Dr. Keyworth, has asked me to emphasize the importance he and the Administration place on minerals and materials policy. We are pleased with the recently issued Administration Program Plan and feel that it will be effective in addressing National materials and minerals needs.

I know you'll be happy to hear that I intend to be brief today, and address the proposed "Critical Materials Act of 1981" (H.R. 4281) in light of the focus that the Administration's Program Plan brings. I would like to start by expressing appreciation to Chairmen Fuqua, Walgren and Glickman as well as to the other co-sponsors of H.R. 4281 for recognizing the importance of addressing the need for

high level coordination of the many materials and minerals activities within the Federal government. OSTP shares this concern as I'm sure my fellow panel members do also. The Administration is committed to dealing with the increasing dependence of the United States and the free world upon foreign sources for strategic and critical materials. This "National Materials and Minerals Program Plan and Report to Congress" sets forth the policy, priorities and coordinating structure to deal with the many parts of this issue. Let me briefly discuss what has been done and what is planned to address this issue. The Cabinet Council on Natural Resources and Environment, made up of Cabinet Officers and chaired by the Secretary of the Interior produced the "National Materials and Minerals Program Plan and Report to Congress." The Cabinet Council provides an excellent minerals and materials policy review mechanism for a number of reasons: ensures high-level consideration of important materials policy issues on a timely basis, provides for prompt action on such issues by the President, and the Cabinet Council requires minimum administrative staff, relying for detailed analysis upon the various agencies and departments which have ultimate statutory responsibility for implementation.

Following completion of the Cabinet Council Program Plan, the President reviewed and transmitted it to the Congress. In his message, the President emphasized the

critical role of minerals to our economy, national defense, and standard of living. He also focused attention on the need for the Federal Government to redirect its materials R&D effort on long-term, high potential payoff activities of wide generic application to improve and augment domestically available materials. In closing, the President expressed that this policy is responsive to America's need for measures to diminish minerals vulnerability by allowing private enterprise to preserve and expand our minerals and materials economy.

Under the Plan, the Administration will continue its review and reform of excessively burdensome or unnecessary regulations and statutes which adversely affect the domestic minerals industry. For example, previous uncertainty in the Deep Seabed Mining Regulations has been removed, making rules for exploration licenses clearer and simpler. More cost effective approaches are being considered for mine safety, noise standards, lead standards, and others. Administrative reforms such as streamlining the process of recording unpatented claims are in progress. Land Access Regulations, Clean Air Act, Clean Water Act are all being reviewed for cost efficiency and adequacy.

Materials stockpile policy is effectively addressed. This Administration has undertaken the first stockpile purchase program in twenty years. In FY 81, the Congress

provided $100 M for acquisition and the President requested an additional $106 M for FY 82, which is currently limited by resolution to $57.6 M. This Administration will streamline the stockpile planning process through five-year planning guidance for GSA acquisitions and disposals, and through a FY plan that matches annual budget ceilings, market conditions, immediate strategic requirements and GSA purchase activities.

In the area of mining and materials R&D, the Administration has previously provided important new tax incentives in the Economic Recovery and Tax Act which should stimulate private R&D and is also reviewing patent policy with similar objectives in mind. OSTP, in concert with each department and agency, has been specifically tasked to direct senior officials in the applicable agencies to maintain or create effective mechanisms for constructive coordination of this R&D policy. Any government financed R&D activities will concentrate on long-term, high-risk high potential payoff projects with the best chance for wide generic application to materials problems and increased productivity. This should give the taxpayer a better payoff for the investment; a bigger "bang-for-the-buck". Coordination of R&D activities has been assigned in the Plan to the Federal Coordinating Council for Science, Engineering, and Technology (FCCSET), which is chaired by Dr. Keyworth. The Plan endorses the previously established Committee on Materials (COMAT), an interagency working group of the FCCSET, and directs:

-- Assistant Secretary-level representation from the departments and agencies concerned with minerals and materials;

-- placement within COMAT of the Department of Defense Material Availability Steering Committee and the Interagency Materials Group;

-- establishment of a Working Panel within COMAT to coordinate federal research and development on essential materials;

-- establishment of a formal mechanism within COMAT for information exchange between agency materials research and development program managers; and,

-- policy resolution of materials research and development questions will be provided through the Cabinet Council on Natural Resources and Environment.

I feel confident that we have the mechanisms in place to effectively coordinate materials and minerals issues. As you know, the Administration's Program Plan was issued on April 5, 1982 and we have not had sufficient time to implement it. We have a meeting of the FCCSET scheduled in May to coordinate plans for implementation of our new policy.

Although fully endorsing the need for effective materials and minerals policy coordination, we feel that the Presidential Commission called for in H.R. 4281 would present an unnecessary, additional bureaucratic structure that would cause inefficiency and delay in materials and minerals policy coordination. It is important to maintain the policy coordination structure closely related to the agencies and departments which have ultimate statutory responsibility for implementation. A new organization or commission would add an unnecessary layer of bureaucracy and dilute agency involvement in policy implementation. The structure now in place should accomplish the needed coordination to implement minerals and materials policy.

Thank you again for this opportunity to testify on this most important matter. I will be glad to answer any questions you may have.

Mr. GLICKMAN. Thank you, Mr. Marcum. We will wait until the other two gentlemen testify.

Mr. Robert Wilson of the Department of Commerce. It is a pleasure to have you here. You may proceed. As I mentioned to Mr. Marcum, if you wish to summarize, that would be fine with the committee, or you may proceed as you wish. Your entire statement will appear in the record.

Mr. WILSON. Thank you, Mr. Chairman.

My name is Robert Wilson and I am Director of the Office of Strategic Resources, U.S. Department of Commerce. I am pleased to have the opportunity to testify before these subcommittees on the "Critical Materials Act of 1981."

We both agree that the administration and Congress share a common concern over the potential problems in minerals and materials supply to our Nation's industries. Two weeks ago yesterday, President Reagan forwarded his national materials and minerals program plan and report to Congress, as required by the act.

This program plan was developed by the Cabinet Council on Natural Resources and the Environment, charged by the administration with coordinating and developing minerals and materials policy. The Cabinet Council established a Strategic Materials Policy Task Force which includes the Department of Commerce and other departments with materials-related responsibilities.

We believe that we have made excellent progress in developing and implementing our materials program, and it is the administration's intent that national materials policy continue to be coordinated through the Cabinet Council. We therefore oppose H.R. 4281. It is true that materials issues warrant a suitably high level in Government for coordination and resolution, but we believe that the Cabinet Council meets the intent of H.R. 4281 in this regard.

The national materials and minerals program plan has been summarized by my colleagues, so I don't feel like going into all of the details of that. I will tell you a little bit more about what the Department of Commerce has done.

We were a major participant in the development of this program plan, and we intend to continue in this role. DOC chaired working groups which developed recommendations on materials research and development, materials analysis, and regulatory reform. We completed our major study of "Critical Materials Requirements of the U.S. Aerospace Industry," which was required by the 1980 act. This study forcasts aerospace requirements for cobalt, chromium, titanium, and tantalum through the year 2000 and examines the use of advanced materials technologies, such as rapid solidification technology and composites. It identifies potential problems in materials supply to the aerospace industry and recommends appropriate policy approaches.

The Department of Commerce is now improving its materials programs based on this analytical foundation. My office has been directed to coordinate the Department's minerals and materials activities. Through an internal program plan, we are focusing DOC's resources on the goals of increasing the competitiveness of materials industries and reducing industry vulnerability to supply disruptions of critical minerals. Among activities planned within the Department are:

One, developing an information base and improving end-use analysis through indepth industry studies as recommended by the 1980 act. Our followup study to the aerospace report will evaluate the critical materials requirements of the steel industry.

Two, we are working with the interagency Minerals Information Coordinating Committee to fill important data gaps and improve Government analysis for policy development.

Three, we are addressing concerns about emergency preparedness. We are working closely with GSA and FEMA to assess the state of the materials in the national defense stockpile.

Four. identifying substitutes for critical materials in essential uses and the best available materials technologies in processing, conservation, recycling, and so forth. We are initiating our materials substitution information program with an industry workshop on chromium substitution in September of 1982. We will also work closely with COMAT in the coordination of Federal materials R. & D.

Five, we are investigating trade policy approaches to materials supply problems. Domestic ferroalloys producers have filed a petition under provisions of the Trade Expansion Act to investigate the national security implications of increasing imports.

Six, we are continuing our efforts to improve the investment climate for seabed mining. We are doing this through our participation in the review of the draft Law of the Sea Treaty.

Seven, we are developing a regular industry consultation program with key association and industry representatives. We especially want to acquire the views of the materials processing and consuming industries so that we can adequately represent their concerns on the Cabinet Council.

In summary, this administration has a comprehensive materials and minerals program plan. It has a coordinating body to implement that plan. The Department of Commerce has a related materials program plan and also a coordinating body. Now that the policies, plans, and mechanisms are established, we must concentrate on the implementation phase.

Thank you for this opportunity to testify and I look forward to working with these subcommittees in addressing this issue.

[The prepared statement of Mr. Wilson follows:]

TESTIMONY OF ROBERT DALE WILSON

DIRECTOR, OFFICE OF STRATEGIC RESOURCES

U.S. DEPARTMENT OF COMMERCE

BEFORE THE JOINT HEARING

SUBCOMMITTEE ON SCIENCE, RESEARCH AND TECHNOLOGY

AND

SUBCOMMITTEE ON TRANSPORTATION, AVIATION AND MATERIALS

OF THE

COMMITTEE ON SCIENCE AND TECHNOLOGY

U.S. HOUSE OF REPRESENTATIVES

APRIL 20, 1982

MR. CHAIRMAN AND MEMBERS OF THE SUBCOMMITTEES:

My name is Robert Dale Wilson and I am the Director of the Office of Strategic Resources, U.S. Department of Commerce. I am pleased to have the opportunity to testify before this joint hearing on the "Critical Materials Act of 1981" (H.R. 4281).

The Administration and Congress have a common concern about potential problems in minerals and materials supply to our nation's industries. Our country's ability to produce and process some minerals and materials has declined over the past decade, and imports account for an increasing share of our materials consumption. Congress passed the "National Materials and Minerals Policy, Research and Development Act of 1980" (P.L. 96-479) because of the lack of a coherent approach to minerals and materials supply issues. Two weeks ago yesterday, President Reagan forwarded his National Materials and Minerals Program Plan and Report to Congress as required by the Act.

This Program Plan was developed by the Cabinet Council on Natural Resources and the Environment, charged by the Administration with coordinating and developing minerals and materials policy. The Cabinet Council, chaired by Secretary Watt, established a Strategic Materials Policy Task Force which

includes the Department of Commerce and other departments with materials-related responsibilities. By using the Task Force and the Cabinet Council as a forum, national policy has been formulated with the assurance that all interested Federal departments and agencies have an opportunity to express their views and make their contribution. In addition, the Cabinet Council process is flexible and can draw on both the strengths of the senior political leadership of the Administration and the expertise of our minerals professionals in the various agencies.

We have made excellent progress in developing and implementing our materials program, and it is the Administration's intent that national materials policy continue to be coordinated through the Cabinet Council on Natural Resources and the Environment. We therefore oppose H.R. 4281. It is true that materials issues warrant a suitably high level in Government for coordination and resolution, but we believe that the Cabinet Council meets the intent of H.R. 4281 in this regard.

In its National Materials and Minerals Program Plan, the Administration has addressed the many different aspects of materials issues. We are seeking to decrease our minerals and materials vulnerability through actions to promote national security, a prosperous economy, and the integrity of our natural resources and environment. The main elements of this plan are

in summary:

- The stimulation of private sector materials research and development through the tax incentives provided by the Economic Recovery Tax Act of 1981 (ERTA) and an emphasis on redirecting Government-sponsored research to basic long-term, high-risk but broadly applicable materials research. We have reaffirmed the coordinating role of the Committee on Materials (COMAT). We fully agree with the Congress on the importance of research and development to materials supply and COMAT will work to give new direction to the revised Government role in this vital area.
- The development of a more effective strategic stockpile with improvements in the quantity, quality, and form of stockpiled materials, and the selling of unneeded materials.
- Continued efforts to stimulate investment in domestic minerals and materials production through regulatory reform and new tax incentives provided by ERTA.
- A reexamination of our wilderness policy and an acceleration of the review of public lands withdrawn from mineral exploration so that the possible multiple use of these lands can be evaluated.
- Improvements in the conduct and coordination of minerals and materials data collection and analysis by the Federal Government.
- Full coordination of materials policy and programs through the Cabinet Council on Natural Resources and the Environment.

The Department of Commerce was a major participant in the development of this Program Plan and we intend to continue in this role. DOC chaired working groups which developed recommendations on materials research and development, materials analysis, and regulatory reform. The Department of Commerce also completed its major study of "Critical Materials Requirements of the U.S. Aerospace Industry" which was required by the 1980 Act. This study forecasts aerospace requirements for cobalt, chromium, titanium, and tantalum through the year 2000 and examines the use of advanced materials technologies such as rapid solidification technology and composites. It identifies potential problems in materials supply to the aerospace industry and recommends appropriate policy approaches.

The Department of Commerce is now improving its materials programs based on this analytical foundation. My office, the Office of Strategic Resources, has been directed to coordinate the Department's minerals and materials activities. Through an internal program plan, we are focusing DOC's resources on the goals of increasing the competitiveness of materials industries and reducing industry vulnerability to supply disruptions of critical minerals. Among activities planned within the Department are:

- Developing an information base and improving end-use analysis through in-depth industry studies as recommended by the 1980 Act. Our follow-up study to the aerospace report will evaluate the critical materials requirements of the steel industry.

- Working with the interagency Minerals Information Coordinating Committee to fill important data gaps and improve Government analysis for policy development. We are particularly interested in developing better information on the regulatory burden and costs of materials industries for input to the overall regulatory reform effort.
- Addressing concerns about emergency preparedness. We will work closely with GSA and FEMA in the next year in assessing the state of the materials in the national defense stockpile. Analytical efforts will be focused on whether alternatives to stockpile acquisition are cost effective.
- Identifying substitutes for critical materials in essential uses and the best available materials technologies in processing, conservation, recycling, etc. We are initiating our materials substitution information program with an industry workshop on chromium substitution in September 1982. We will also work closely with COMAT in the coordination of Federal materials R&D.
- Investigating trade policy approaches to materials supply problems. Domestic ferroalloys producers have filed a petition under provisions of the Trade Expansion Act to investigate the national security implications of increasing imports. The investigation is now ongoing and

the Secretary of Commerce will make a recommendation on this case later this year.

- o Continuing our efforts to improve the investment climate for seabed mining. We are doing this through our participation in the review of the draft Law of the Sea Treaty, the development of seabed mining regulations, and the negotiation of reciprocal arrangements among seabed mining nations.
- o Developing a regular industry consultation program with key association and industry representatives. We especially want to acquire the views of the materials processing and consuming industries so that we can adequately represent their concerns on the Cabinet Council on Natural Resources and the Environment.

In summary, this Administration has a comprehensive Materials and Minerals Program Plan. It has a coordinating body to implement this plan -- the Cabinet Council on Natural Resources and the Environment. The Department of Commerce has a related materials program plan and also a coordinating body -- the Office of Strategic Resources. Now that the policies, plans and mechanisms are established, we must concentrate on the implementation phase. The goals of the Administration, the Congress, and the Department of Commerce are one and the same -- to improve the competitiveness of our basic industries and to reduce minerals and materials supply vulnerability in cost effective ways. I thank you for this opportunity to testify and look forward to working with you in addressing these important strategic resource issues.

UNITED STATES DEPARTMENT OF
COMMERCE
NEWS
WASHINGTON, D.C. 20230

OFFICE OF THE
SECRETARY

Robert Wilson of South Carolina
Appointed to Commerce Post

Robert Dale Wilson, 29, of Columbia, S.C., has been appointed director of the new Office of Strategic Resources, the U.S. Department of Commerce announced today.

Wilson has been executive assistant to Associate Deputy Secretary Martha Hesse since March. Secretary Malcolm Baldrige signed his new appointment on Dec. 18. Wilson has worked on strategic resource issues and has represented the department on the Cabinet Council Working Group on Strategic Resource Issues.

The new office will be assigned to the economic affairs group headed by Assistant Secretary Robert G. Dederick; it will coordinate all departmental activities related to strategic materials and minerals.

Wilson said the office would coordinate studies of industries that are heavy users of strategic materials; identify current and innovative practices in the materials industries such as conservation, substitution, recycling, reclamation, and processing; and coordinate studies of government stockpiles. The office also will develop a business consultation program to ensure that the viewpoints of users of materials and minerals will be considered in the development of strategic resource policies.

Wilson formerly was engaged in private law practice in Columbia. He was co-chairman of Lawyers for Reagan, South Carolina.

He graduated magna cum laude from the University of South Carolina in 1975 and received his law degree from the university in 1978. He is married to the former Judy K. Heaton; both are natives of Aiken County, S.C.

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1/5/82

Mr. GLICKMAN. Thank you, Mr. Wilson. I appreciate your summary, too.

Our last witness in this panel is Mr. William Pendley, deputy assistant secretary for Energy and Minerals of the Department of Interior. It is a pleasure to have you here.

You may proceed, and your entire statement will appear in the record.

Mr. PENDLEY. Thank you, Mr. Chairman.

I would like to congratulate you, Mr. Chairman, and the chairman of the full committee for the courage and leadership that this committee, in particular, has demonstrated over the past several years with regard to America's materials needs. This is particularly with regard to the focus that this committee placed upon materials R. & D. as well as minerals policy and the adoption of the 1980 act. This administration shares your concern.

The President, as you know, on April 5 released what I think is the greatest statement a President has ever made with regard to the role minerals and materials play in the economy, in the national defense, and to the accomplishment of America's standard of living. It certainly is the first such statement by a President in over three decades, the first since President Eisenhower's December 1, 1954 statement. I think it is comprehensive, it is more aggressive and, frankly, given the state in which we find ourselves, it needed to be more aggressive.

Mr. Chairman, you have received this morning an excellent summary from John Marcum and Bob Wilson of the substance of what the President has proposed and the job that lies ahead of us. I might just say in summary that we have a tremendous task ahead of us. What we have proposed is merely the first step in a very long road to return America to its greatness and to achieve the goals that we must reach to have a strong economy and national defense and a healthy standard of living.

Let me focus for a few minutes on the activities of the Department of the Interior with regard to minerals policy. I think we have a very outstanding record. We are proud of our job over the past year.

We take to heart the direction of the Congress in the Mining and Minerals Policy Act of 1970 to "foster and encourage" a domestic minerals industry. We have other responsibilities, of course, but we are intent upon accomplishing that directive which the Congress gave to the Executive Branch over 10-years ago, and was reaffirmed in 1980 by the actions of this committee. We have moved aggressively in that direction.

We have revoked some 120 outdated land withdrawals, returning approximately 20 million acres to multiple use. We have adopted for the first time in 30 years an OCS hard rock minerals policy and program. As you know, in 1953 when the OCS Lands Act was adopted, provisions were made for an OCS hard rock mining program. No administration in history adopted such a program. Earlier this year, Secretary Watt did, and we will move aggressively in the future with regard to manganese nodules in the Blake Plateau off the Coast of Georgia, with regard to sand and gravel off the Coast of Alaska and, in the future, if the interest lies there in chromite resources, among others, off the Coast of Oregon.

We have opened up five national recreation areas to strategic and critical mineral leasing. As you know, Mr. Chairman, the Congress adopted these five NRAs, they made provisions for leasing of minerals on those lands. And no administration in history took that direction to heart; we did. We insured that those lands are now available as the Congress fully intended.

We have for the first time in the Bureau of Land Management, the Federal Government's leasing authority, a deputy director for Energy and Minerals to insure proper focus of that responsibility in the Bureau of Land Management's land managing responsibilities. And we have adopted a procedure we like to call GEM, which is geology, energy, and minerals evaluation, to insure that in the land use planning which affects one-third of the Nation that energy and mineral concerns, particularly strategic minerals, are taken into account.

We have massively reorganized the Bureau of Mines to return that agency to the strong position that it has held in years past, particularly as an advocate of the public interest, the interest that the public has in maintaining a strong domestic minerals sector. In addition, we have significantly redirected the research and development activities of the Bureau. One of the first actions we took in February of 1981 was to request a change of some $8.6 million in research and development activities that the Bureau of Mines was doing in order to insure that we focused upon the strategic and critical minerals issues, including questions of recycling and substitution.

I might add that, out of the $8.6 million, the Congress did approve a $5.8 million change, and we are moving ahead with new increases in this very important program.

Our U.S. Geological Survey is increasing its activities in mapping to insure that the proper maps are available for exploration and development of public lands which are available to multiple use, and we have significantly increased USGS funding with regard to their research into the science of the occurrence of mineral resources so we might know better about what resources are there and how we might best find them.

In addition, the Secretary has recently announced, as you know, a major wilderness policy which we think both protects the wilderness that has been created and places impetus upon the Congress to move rapidly to end the uncertainty with regard to the public lands. The bill would also provide Congress the opporutnity to reexamine the question of wilderness and the foregone values and the mineral resources in the year 2000. I think the Department has embarked on an exciting program. Of course, we realize that the Mining and Minerals Policy Act of 1970 speaks both to energy minerals as well as non-fuel minerals. I have focused this morning, because of the concern of this committee, just on the strategic and critical minerals area.

The administration shares this concern. It is not just focused in one department or agency, it is administration-wide. Whether you talk of the Department of Defense or Department of Commerce or the Department of State, we all share a deep concern about strategic and critical minerals.

Our activity with regard to the minerals industry is focused on such things as our Economic Recovery Tax Act of 1981 which provides for the revitalization of the domestic industry. We have moved aggressively to reexamine the public and national interest, in the Law of the Sea Treaty negotiations now ongoing, to insure that our concerns are properly taken care of. We have asked for a 5-year reauthorization of the Defense Production Act, and we have moved aggressively to implement that act to insure a responsiveness on the part of the administration. As you know, Mr. Chairman, for the first time in 20 years, an administration has moved aggressively to implement and to fulfill the stockpile as it was intended to be.

We are opposed to H.R. 4281, Mr. Chairman, because we believe we now have in place a structure which provides the capability to be responsive. It is not a sub-Cabinet group, it is a Cabinet-level group. It involves the participation of Cabinet officials and directors of agencies throughout the Federal Government who focus upon these issues. In fact, in the creation of this policy, we did have that high-level involvement, we did have two full Cabinet sessions to discuss the issue, and it was focused on by the highest level of administration officials.

We believe that we can be responsive. We believe that we will be responsive to the concerns of this Congress. In fact, we are now involved in such a process under the defense appropriations bill with regard to silver sales. We are using this Cabinet Council mechanism to study the question that the Congress has asked us to study, and we will shortly submit our findings to the Congress.

Mr. Chairman, that concludes my summary remarks. I do appreciate the opportunity to be here. Mr. Chairman, I want to thank you and the chairman of the full committee again for the support that this committee has given this administration for our aggressive attitude and approach to these strategic materials issues.

[The prepared statement of Mr. Pendley follows:]

Statement of William P. Pendley
Assistant Secretary--Energy and Minerals
Department of the Interior
before the
Subcommittee on Science, Research and Technology
and the
Subcommittee on Transportation, Aviation and Materials
Committee on Science and Technology
U.S. House of Representatives

Tuesday, April 20, 1982

Mr. Chairman, Ladies and Gentlemen:

It gives me great pleasure to appear before this joint hearing of your two subcommittees to provide the views of the Department of the Interior and of the Administration on H.R. 4281 - the "Critical Materials Act of 1980," as well as our comments on the implementation of PL 69-479, the "National Materials and Minerals Policy, Research and Development Act of 1980."

President Reagan was concerned with the strategic materials posture of the nation even before his Administration took office in January 1981. A panel of distinguished experts had prepared a detailed report on the nation's strategic materials position for the President-elect. This report was reviewed by Secretary James Watt before he became the Secretary of the Interior. Certainly the earlier work of your Committee, which culminated in the 1980 Act, served to heighten the interest in, and concern for, our national materials position.

Early in the Administration, the President's Cabinet Council on Natural Resources and the Environment, chaired pro tempore by Secretary Watt, tackled the job of establishing a policy position on minerals and materials. While a subcabinet-level working group was established in part to develop the report to the Congress called for by Section 5 of PL 96-479, its more fundamental

goal was to put on record this Administration's commitment that mineral and materials issues would receive the long overdue national attention they need. The deep commitment of President Reagan's Administration became evident even before the President's report was released. Several Cabinet members and other Administration officials spoke out forcefully on the need to reverse the pattern of inattention given to long-range minerals and materials availability. Clearly there had been a lack of foresight given to minerals and materials issues in the interrelated areas of foreign, national security, public land, and general domestic policies.

This minerals and materials connection was well understood by the Committee on Science and Technology as you worked to put into law the purpose and objectives of PL 96-479. The Cabinet Council therefore did not attempt to restudy what had been studied over and over in the past. Rather, the group focused on the problems in light of past studies and existing evidence with the aim of raising the issue to a national priority.

The country could not afford to await the completion of still more protracted studies before remedial actions were taken. Secretary Watt therefore moved directly and forthrightly, within the limits of his legislated authority, to facilitate access to our public lands. This was done not only to stimulate the production of strategic materials but more importantly to restore sound multiple use which is so essential to America's economy and which includes careful attention to conservation and environmental principles.

On March 13, 1981, President Reagan called for the expenditure of $100 million for the first major addition to our strategic stockpiles in over two decades. $78 million went to purchase cobalt, a material critical to our national defense yet seriously short of the National Defense Stockpile goal.

Partly in response to Section 5(e) of PL 96-479 and partly in response to his own deeply-felt concerns, Secretary Watt initiated a reorganization of the Bureau of Mines to improve its capacity to assess international minerals supplies. He redirected several million dollars to increase the level of the Bureau's mining and metallurgical research in strategic and critical minerals. Mineral and energy resources were placed on an equal footing with other resources in Federal land use decisionmaking within the Bureau of Land Management. In more recent months the Secretary has created the Minerals Management Service, elevating the former Conservation Division of the U.S. Geological Survey to an enhanced position in the Department.

It is important to note that the President clearly emphasized that the actions taken and proposed do not represent the entire solution to our mineral and material problems. Rather, these important initiations are the beginning of a realistic national approach toward meeting the objectives of the 1980 Act. Meanwhile, intensive consideration by the Cabinet Council on Natural Resources and Environment continued. One early benefit of such consideration was the direction given by the State Department to our negotiators at the Third United Nations Conference on the Law of the Sea. They were told that the United States would take a much firmer position with respect to assuring U.S. firms access to deep sea nodules and other resources than had been contained in the then-existing draft of the Law of the Sea Treaty. This determination to assure access to the mineral wealth that lies not only beneath our own borders but also beneath the oceans of the world was clearly expressed in President Reagan's statement of January 29, 1982.

As emphasized in the 1980 Act, the relationship between materials and the national security is fundamental. In this regard, this Administration has consistently advocated a 5-year extension of the basic Defense Production Act, which provides the foundation for meeting many materials needs of our defense and defense-related activities.

Last year we were pleased to see that the Congress extended the basic act for one year, but we note that this legislation is currently scheduled to expire again on September 30, 1982. We strongly urge the members of this Committee to ensure that the existing Defense Production Act be extended for a 5-year period. In these critical days, it is crucial that we send a clear signal to our own people, to our allies, and to those who would threaten world peace, that the United States is determined to improve our national security posture.

President Reagan's increasing concern with the defense posture of this country motivated him to establish the Emergency Mobilization Preparedness Board on December 17, 1981. This important Board which is chaired by the Assistant to the President for National Security Affairs, consists of representatives of 23 key Federal departments, agencies, and executive offices. The mandate of the group is to develop overall policy and a specific plan of action which will immediately improve the nation's preparedness capabilities.

President Reagan's National Materials and Minerals Plan and Report which was submitted to the Congress on April 5, covers the several items already mentioned. In addition, the report emphasizes the Administration's important role in encouraging investment in our basic industries through the tax benefits provided by the Economic Recovery Tax Act of 1981.

Both the Cabinet Council on Natural Resources and Environment and senior officials of the White House Staff engaged in long and careful deliberations on these mineral issues.

The Administration's efforts to reduce unnecessary and burdensome regulations should also be of benefit to industrial development. In this connection, it is worth noting that the "Federal Register" of 1981 contained 64,000 pages--23,000 less that it had in 1980. And in the first-quarter of this year, the Federal Register has been running at the rate of only 55,000 pages per year.

We believe in the ingenuity of the American free enterprise system. It is vitally important for government to encourage the search for, and development of, domestic supplies of minerals needed by the American economy. This is fundamental to revitalizing our economy, providing jobs and providing the opportunity for more Americans to enjoy a high standard of living.

In the context of government regulation, we again stress the vital importance of balanced public land policies which recognize the high potential that many of our public lands hold for critical and strategic minerals, and which acknowledge the fact that exploration and production operations can be conducted in an environmentally sound way.

In your letter of invitation to appear today, you specifically requested our comments on HR 4281. We recognize fully this Committee's past concern with the nation's materials posture. HR 4281 was introduced on July 27, 1981, prior to many of the actions already described in this statement and covered at greater specificity in President Reagan's National Materials and Minerals Program Plan of April 5, 1982. The thrust of HR 4281 is to create yet another government agency known as the Council on Critical Materials.

We believe, wherever possible, the Federal Government should be streamlined and simplified. It certainly need not and should not be expanded further.

The existing 5 Cabinet Councils and the Emergency Mobilization Planning Board, plus the regular program reviews by the Office of Management and Budget, assisted by the President's Science Advisor, obviates the need for the Council proposed by HR 4281. We do not need more Councils, more studies, and more reports. For these reasons, we oppose enactment of this well-intentioned legislation.

What we do need is action on the findings and recommendations of earlier studies and reports, including those of your committee; the a fuller inventory of energy and mineral resources on those public lands; strategic stockpiling; and an extension of the Defense Production Act. We look forward to working with you in implementing these mutual goals.

Mr. GLICKMAN. Thank you for testifying.

We have been joined by Mr. George Brown, the former chairman of one of the subcommittees, and I know that he will have some questions of you, too.

I am going to have a number of questions. I appreciate all of your testimony. I realize that there has been some effort done in the last year and a half to enhance federal efforts related to critical materials, although I would have to tell you that, except for the Department of Defense testimony, much of the testimony today sounds fairly ideological and self-serving. Also, there is kind of a tendency I sense in this testimony to prefer the development of domestic lands over the development of substitutes with no mention of foreign policy implications and related concerns. I am going to get into these questions, and you might think about what I just said.

I would first like to ask another question, and I guess it would be addressed to Mr. Pendley but anybody else may want to answer. The 1980 act stated that the Executive Office of the President on specific departments should implement the policies and programs expressed there in. Yet, to a large extent, 1½ years after the act's passage, many of the programs have not yet been acted on or analyzed. For example, section 4 of the act calls for the improved collection, analysis and dissemination of materials information. Similarly, section 5 calls for the Secretary of the Interior to improve analysis, of mineral data in Federal land use decisionmaking. However, the administration's policy statement calls only for an examination of minerals data, including its use for Federal land use and the possible benefit of a minerals information center. I speak of minerals. We talked about materials before. There is a big difference between a rock and its final use, as Mr. Donnelly so aptly stated.

Why has the administration been so slow to carry out these and other provisions of the act, and who is going to do these analyses, and what is the present timetable for that completion?

Mr. PENDLEY. Mr. Chairman, I think that the administration has been responsive. I think this administration, for the first time, has involved the questions of materials and minerals and energy resources in the land use planning process. In the past, that has not been the case. For the first time, we do have a deputy director of the Bureau of Land Management whose sole responsibility is to insure that these concerns are plugged into the land use planning process that BLM undertakes.

We do have an opportunity for our geologists and for our mining engineers to look at these decisions that are being made in BLM and the recommendations that are being made in BLM and the conflicting uses that occur with regard to the public lands to insure that the public interest, with regard to the development of these important resources, are taken into account.

With regard to our data analysis capability, we have moved to strengthen that ability in the Bureau of Mines to insure that this Nation understands our own mineral questions, and those of foreign mineral resources. We have increased the funding for our data equipment, and our minerals availability system. Our mass system is second to none in the world as far as accumulated knowledge.

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We have insured that the private sector reporting to that system is minimized so as not to be overly burdensome but at the same time, our actions have insured that the system has the capability to provide information to the President and to the Cabinet Council with regard to minerals policy.

So, Mr. Chairman, I think we have moved very aggressively to implement the intent of the act.

Mr. GLICKMAN. To go back to my question, how do you define minerals versus how do you defind materials? That, I guess, is where we are coming from in terms of the organizational issue. There is a difference between the rock and its end use. I got the implication from Mr. Donnelly's testimony that DOD—and that is, I believe, where the heart of our critical resources and materials issue is—is more concerned about end use. And you and Interior seem to be concerned only about the rock part of the situation, which is only a small part of the larger problem.

So I would ask you, how would you define the difference between minerals and materials?

Mr. PENDLEY. Mr. Chairman—your question is well placed. Because of the statutory responsibilities that we have the differences that we have, and we do have that split of concerns. You are right. The Department of the Interior focuses its attention upon getting the mineral resources and making them available and insuring that they can be economically developed. At that point, of course, the Department of Commerce takes over with regard to some of the end use applications and to insure some of these other aspects. Certainly the Department of Defense is a consumer of these products and the Department of Defense is properly concerned about the end use application of many of these resources.

I think it would be redundant for the Department of the Interior to spread its focus into these areas. An exception however, is the Bureau of Mines research and development activities in the area of substitutes.

Mr. GLICKMAN. Let me ask you this question for anybody here: How easy is it to determine what is a critical or strategic material? Who defines that?

Mr. PENDLEY. Mr. Chairman, that has been defined by the Congress in the Strategic and Critical Materials Stockpile Act of 1939, and the list has been developed by an interagency group in past years based upon the availability of supply domestically, the availability of supply from close or friendly sources, and the amount of supply that comes from foreign interruptible sources. Taking into account all those factors, a final number is determined for the materials which are needed during a 3-year wartime. That is the definition we use most.

Mr. GLICKMAN. I would like Defense, Mr. Foster, to answer that question. First of all, how easy is it to determine what is a critical or strategic material, and how are material requirements for national security determined now? I think that is key to what we are trying to deal with.

Mr. FOSTER. If we took the two terms, "strategic" and "critical," I guess our definition would be that critical is needed for the production of weapons systems and strategic as insofar as where their location is.

Mr. GLICKMAN. Strategic relates to location?

Mr. FOSTER. Location, yes.

Mr. GLICKMAN. Do you mean location as to where the minerals might be produced?

Mr. FOSTER. Where the minerals and the processing facilities would be found.

Mr. GLICKMAN. OK.

Mr. Pendley talked about this determination is made pursuant to the 1939 Federal law. How do you make that determination as to what is strategic and critical? Do you rely on some interagency task force or is that done internally?

Mr. FOSTER. That is done as an interagency activity to determine for the 90-some-odd materials in the critical stockpile.

Mr. GLICKMAN. The reason why I asked is that, in the President's report, the words "critical," "strategic" or "essential" and "materials" and "minerals," five terms of art, all seem to be used interchangeably. So I want to get some understanding as to what their definitions are. You define critical and strategic; how about essential? Is that a term of art, or is that just a subjective term?

Mr. FOSTER. I don't have a definition for essential, except for perhaps survival of the country.

Mr. GLICKMAN. OK. Mr. Wilson or Mr. Marcum, I wonder if you might respond to any of the questions that I am asking here now?

Mr. WILSON. We define it at the Commerce Department as primary, secondary, or fabricated materials which are essential to the industrial base in which we might find ourselves import dependent on or the processing capabilities have declined. So it is a dynamic term that it can change in any given situation. That is our definition of strategic.

I think essential materials is a little bit redundant in that essential materials would probably include strategic and critical. As you move up the list to what the particular mineral or material is used for, obviously it becomes more critical.

Mr. GLICKMAN. Mr. Marcum, do you have any comments on any of these?

Mr. MARCUM. No. I essentially agree with Mr. Wilson. I think this is a dynamic standard. The essential characterization is really one that is not different from any normal dictionary usage.

Mr. GLICKMAN. Let me go back to the Department of Defense. What research and development programs for substitution are being considered by the Department of Defense?

Please state your name for the record.

Mr. PERSH. My name is Jerome Persh, staff specialist, materials and structures.

We view our composites program as being, first, performance related, to improve performance in military equipment. But a great deal of the program, what it is generating could be considered substitutes. For example, practically every one of our military aircraft in production now has composites in use. We have displaced aluminum and we have displaced titanium by the use of composites.

Now the intent of the program was not to develop substitutes, but to develop aircraft which would have performance capabilities that the aircraft using aluminum would not. So that, in a sense, is a substitute.

In other parts of our composites program, in metal matrix, we are developing metal matrix materials which can displace beryllium. There are several other examples where the intent of the program is to improve performance, reduce costs, reliability, and so on. But, as you go along, you find you are displacing critical materials. It is placed in the back of people's minds. And there are some things that we cannot develop substitutes for.

Mr. GLICKMAN. Like what?

Mr. PERSH. Titanium. We are doing work on development of titanium for seagoing operations. I don't want to get into classified matters. Now, that particular metal has certain attributes which we have to have. We are developing for this particular application the weldability, the fracture toughness, and so on. We are also developing titanium for aircraft, which is a different alloy of titanium. For that application of titanium, we can't develop an alternate in metal matrix. But for the seagoing operation, there is no substitute. We have got to use that material.

Mr. GLICKMAN. Have you developed an R. & D. program plan for substitution beyond that mentioned in the testimony? I think you talked about an $80 million, as I recall, in basic R. & D.

Mr. PERSH. What Mr. Donnelly spoke of, that was the ongoing composites program.

Mr. GLICKMAN. OK. What else do you have besides that in terms of materials substitution or materials research and development?

Mr. PERSH. Within our rapid solidification program, which is coordinated under COMAT, we have a rapid solidification working group. Our portion of the program will develop superalloys for gas turbine applications which, hopefully, will have lower contents of cobalt, chromium, and so on. But that is in the future.

Mr. GLICKMAN. Do you have any new initiatives planned for consideration?

Mr. PERSH. Yes. We are very seriously looking at the use of carbon composites for gas turbine applications. We are very seriously looking at it. It is a very difficult research problem.

Mr. GLICKMAN. For how many years and what kind of dollar commitment are you talking about?

Mr. PERSH. It is probably a good 7 to 10-year program to do this. Now, if that can be done—the problem here is oxidation, carbon oxidizes very rapidly in high temperatures—if we can protect the carbon, we can displace an immense amount of superalloy materials, very expensive super alloy materials.

That is funded at a relatively low level now. But it will build up over the years as we see some promise in it. As a matter of fact, the Senate Armed Services Committee, in their report on the authorizing appropriations, added, I believe, $2 million to the defense appropriations just for that program because it promises a vast savings in critical materials.

Mr. GLICKMAN. I would like to ask either you or Mr. Foster this question: Do you find some conflict between the Interior Department's and OSTP's statement that there will be long-term, high-risk technology research; that the private sector should have all the incentives with the Tax Act to do everything else related to your needs for critical and strategic materials? For example, do you think, given the current economic climate, that the private

sector can do any of this research or will have the resources to do it, even defense contractors?

I guess what worries me is that in fact we have these enormous potential shortages of certain key materials and minerals, and if the commitment on behalf of the administration is geared more towards opening up public lands and letting the private sector—if the marketplace is there find the answers. Wouldn't that be a little bit contradictory with DOD's needs to, in a more immediate fashion, develop materials substitutes?

Mr. FOSTER. I think we could say that the Department of Defense never really totally depended on anybody else for its R. & D., it had its own efforts. If we took a look at where we are now in aircraft R. & D. and its results in fighter aircraft, we find that, as Mr. Persh was saying, we have an AV-8B Harrier Jump Jet that we make for the Marine Corps which consists of somewhere around 26 percent composites by weight. We have an F–15 which consists of about almost 15 percent composites by weight—no, that one is less. The F–18 is about 15 percent composites by weight, and F–15 is not quite 15 percent.

What I am saying is that we haven't waited for anyone else; we have our own R. & D. We should really recognize that the R. & D. efforts by the Department of Defense is mission related for the improvement of weapons systems. In some cases, as you know, our advantage over other countries is marginal, at best, and we wouldn't want to sacrifice that capability for substitutes alone. It has to remain with the capability of weapons systems to perform.

Mr. GLICKMAN. OK. But that gets to the basic heart of this bill that we talked about. That is that, if the Department of Defense essentially does its own thing, how does that relate to policy conflicts with the Cabinet-level council that may have other things or other issues that it wants to pursue? What is concerning me is that if the Interior Department wants to, let us say, pursue a minerals and materials policy, and Mr. Watt is Chairman of the Cabinet-level Council, it could turn out to be totally irrelevant to what you are doing and you will pursue your own thing. I guess that is what bothers me now.

Mr. PERSH. Let me try this one. There are certain things that we have to do. For instance, the private sector will not do research and development in tank armor, tank treads, gun barrels, ammunition. There is no civilian use for that. We cannot depend on anybody else to do that research and development. That is what is meant in the statement by mission related R. & D. We do an awful lot in submarines, ships, ammunition, ordinance, space vehicles.

Mr. GLICKMAN. But that relates to some degree to aerospace. What you are doing still relates in some degree to the nondefense side of the picture, not wholly, but—for example, I guess the Department of Commerce talks in their statement about doing a study on steel and resources needs. You were supposed to have been doing and maybe you have been doing a thing on the aerospace industry in the Commerce Department.

Mr. WILSON. We have completed that one, yes.

Mr. GLICKMAN. You have completed it.

That has got to relate to what the Department of Defense does in some degree, because building an airplane is building an airplane

even though an F-18 may have slightly different needs than a 767. I just visited the Boeing plant in Seattle, and I know that there are a tremendous number of composites going on these new airplanes. That is a consumer item. Part of that was done by DOD work, part of it was NASA work, part of it may have been private sector work.

I guess what bothers me through all of this discussion is that if the heart of Government work now, even with what you said, Mr. Pendley, is going to be in the Department of Defense, and you have a Cabinet-level Council that is supposed to be coordinating "materials policy," and if DOD continues to essentially do their own thing, which I would expect them to do, I am not sure that what you have proposed is all going to be very effective.

Mr. MARCUM. Let me try to respond to that, Mr. Chairman. I think, first of all, we have to recognize there is an essential distinction between the programs that this administration wants to be increasingly undertaken as a responsibility of the private sector and those programs which are funded to meet critical defense needs. Some of the programs that have been described clearly do not fall under this juncture of the Government feeling that it would be inappropriate to fund nearer-term research and development activities.

The areas where we want to shift our emphasis into the longer-term, potentially high-risk, high-payoff areas, are those areas which are not the subject of critical defense requirements.

Let me also explain a little something more about the way that issues are coordinated at the White House. For example, there would be three different channels by which issues might in fact be raised to the level of attention of the President. One would be the Cabinet Council that we have discussed in the testimony today. Another, in the event of an urgent defense need, which required special attention or special funding, would be to proceed through the National Security Council system. There is a National Security Council process, National Security Council meetings would be held, and there is an entirely different procedure for proving critical defense needs. Finally, in any case, no agency, of course, goes off and does what it wants to do or does its own thing. Its budget requests are approved through the Office of Management and Budget and reviewed within the White House and by other interested parties.

The essence of the plan that we have transmitted to you is that, for those activities which do not come under this special defense requirements category, we will have a regular coordinating procedure which consists of the Cabinet Council and, in the research and development area, the Federal Coordinating Council. Those mechanisms, with the subgroup of the COMAT, will insure the kind of information exchange, accessed programs and budgets, that I think you are concerned about.

Now, there is the other channel, though, and that is the essential thing that I wanted to point out.

Mr. GLICKMAN. How active has OSTP, within the Cabinet Council been involved in the preparation of the President's report? How critical or active a participant has the OSTP been in the development of this report?

Mr. MARCUM. We have participated—for example, I am the assistant director of the office and Dr. Keyworth is the director and the science advisor to the President. One or the other of us has participated in the Cabinet Council sessions themselves. I have also participated and members of my staff in some of the preparation of working group papers, particularly in the research and development area.

Mr. GLICKMAN. Would you consider that as major participation?

Mr. MARCUM. I think given the size and the responsibilities of our office, I would certainly consider that to be major and appropriate participation.

Mr. GLICKMAN. Before I move to Mr. Brown, I would like to ask one final question. How is foreign policy—not how it relates substantively, but how logistically—is foreign policy regarding minerals and materials developed vis-a-vis the Cabinet Council? Who is responsible? Where is that transfer?

Mr. WILSON. The International Trade Administration within the Department has primary responsibility.

Mr. GLICKMAN. Within the Department of Commerce?

Mr. WILSON. Within the Department of Commerce, right, special trade representative. The general philosophical framework is that we don't want specialized commodity policies or foreign policies based on commodities because they have not proved workable in the past. In the recent policy statement, though, you have seen where State, Defense and the International Trade Administration all take light of our particular vulnerability of a particular material from some country when they are arriving at trade policies. So the matter is receiving attention.

Mr. GLICKMAN. But I am talking about the question of foreign policy now. What is the responsibility of the Secretary of State in all of this? How are they involved in transferring, let us say, needs into foreign policy considerations?

Mr. PENDLEY. Mr. Chairman, the Department of State has been an active participant and a major participant in the development of the policy. As you note by some of the statements in the policy itself, there are indications about cooperation with foreign countries, particularly with our European allies, with regard to an understanding of our Nation's minerals needs and their minerals needs, the status of the stockpile, cooperation with regard to research and development activities and others. So the Department of State is a participant in the Cabinet Council.

I want to clear up what may be a misconception about the Cabinet Council. Although the Cabinet Council on Energy and Natural Resources is limited to some six members, in fact the Cabinet Council itself expands to accommodate a broad area of interests. If all the Cabinet members are interested in a particular topic, as they are interested in the matter of strategic materials, they all participate. It is not a closed-door session; anyone who desires to participate on a particular issue may participate at the Cabinet level in the Cabinet Council.

Mr. GLICKMAN. Let me ask you this question: How many times has the Cabinet Council met?

Mr. PENDLEY. I have no idea, Mr. Chairman.

Mr. GLICKMAN. I mean five, two, one, twenty, thirty?

Mr. MARCUM. It meets with considerable frequency, as a matter of fact. I wouldn't want to hazard a guess as to, within this administration, as to whether it might be on the order of 20 times. It certainly met on that order, in other words, with the frequency of usually more than one meeting per month.

I think the question you want to ask, of course, is how many times has it met on this particular issue. That is something that I am sure Mr. Pendley might be able to address.

Mr. GLICKMAN. Do you know? If you don't, we would like that provided for the record, if possible.

Mr. PENDLEY. They had two full Cabinet sessions on this policy statement.

Mr. GLICKMAN. What kind of staffing is dedicated to the Cabinet Council in connection with the implementation of this act or in materials and minerals related issues?

Mr. PENDLEY. Mr. Chairman, the Office of Policy Development of the White House provides staff to the Cabinet Councils. I can't speak directly to that. It differs with each Cabinet officer. The implementation of the policy statement is to be undertaken by each of the departments that have responsibilities, as we indicated in the statement.

Mr. GLICKMAN. Mr. Brown.

Mr. BROWN. Thank you, Mr. Chairman. I don't have too many questions and I don't have the extensive involvement in this area that you do.

I am looking at the President's report and attached to it is Attachment B, a list of the national defense stockpile inventory. I wonder if you gentlemen could take a look at it. I want to ask you to help me understand just what the policy is on things like that. Look at the items in which there is either a shortage with a dollar value in excess of $1 billion, which is a large number, and explain to me what the situation is with regard to policy on this items. There are not very many, maybe a half a dozen.

For example, aluminum, we have a situation where there is a very small amount of aluminum on hand and we have a very large FEMA goal, 700,000 short tons. We are short over $1 billion worth of aluminum, yet that is the most common element that is available. I just wonder why we list it as a billion-dollar shortage when it could be acquired in the market without too much trouble? Is it a matter of where we set a target that is unrealistic or what?

Mr. PENDLEY. Mr. Chairman, the question of stockpile policy is a question for the Federal Emergency Management Agency, as you know, or FEMA. The stockpile goals are set by the administration in an interagency body with participation from the agencies you see represented here today, as well as others. This group takes into account the fact that the system is dynamic and changes occur in our domestic supply, as well as our smelting, and productive capacity and our source of supply from foreign sources. It is reviewed on a fairly constant basis in the face of these changes.

I can't respond any further than that with regard to the wisdom of this particular goal, but I can tell you that it has been reviewed and that the goal that you see there is the present conclusion of the administration. As I said, however, we are constantly reviewing the subject.

Mr. BROWN. Well, the question that I would have is that if you would have that goal, and aluminum prices are depressed—and I am going to ask the same thing about some of these others—copper, for example. There is a shortage of nearly $2 billion in copper. Copper is at its lowest price in history almost at the present time. Copper firms are going broke for lack of a market.

I am asking where the policy is that rational people would follow in a circumstance like this? Is somebody in charge? Why aren't we doing something, either changing the goals or using this best available of all times to meet the goals?

Mr. PENDLEY. Mr. Chairman, FEMA is engaged in purchasing at this time. I can't comment specifically. They have requested increased funding for these purchases. At the same time, the administration has requested that we dispose of some of these excess materials and use the funds we receive as a result of those sales to acquire additional supplies. In addition, we wish to use a bartering exchange of some of our excess commodities from other areas to acquire additional supplies.

Our effort to dispose of silver, for example, to purchase additional supplies has been delayed somewhat because of an amendment was attached to the Defense Appropriations Act, and we are now involved in the study of the silver disposal. At the same time, we are faced with the fact that the metal prices are low. They are low for those we want to acquire, as well as those that we want to sell. So we do have a problem with regard to the disposal.

Mr. BROWN. But our national defense is the most important problem facing this Nation, isn't it?

Mr. PENDLEY. I certainly agree with that, Mr. Chairman.

Mr. BROWN. We are not going to let a little thing like a shortage of money stop us.

Mr. PENDLEY. I think that maybe Mr. Donnelly might want to respond to that or Mr. Foster.

Mr. MARCUM. Let me take a crack at that, Mr. Brown, if I might. I would like to just point out that, first of all, the targets that you see in there are set by FEMA. After those targets are set, we, as pointed out, as a matter of fact, in this new program plan, will make purchase decisions based on a 5-year planning cycle which has to take into account overall budgetary ceilings and our other essential priority which is economic recovery.

In the fiscal year 1982 budget, as I mentioned in my own testimony, the President requested $106 million in additional money for stockpile purchases. That is currently limited by resolution, the budgetary resolution, to $57.6 million. We have several different constraints that have to be satisfied.

I think that this is a dynamic process. These represent desirable targets, but they are not targets which are set and expected to be achieved independently without balancing other or overall budgetary objectives and priorities.

Mr. BROWN. Well, as I say, I am not sophisticated in this. I am trying to understand the relationship that all of this has to a national material policy. If I can't elicit from you gentlemen who are supposed to be the most conversant with it a rational explanation of these things, I am going to assume that we really don't have a very well coordinated or rational materials policy.

I am just picking on the big ticket items here in excess of $1 billion. Of course, all of these targets could be met over a reasonable period of time by—as I read the bottom line here, we have an excess of over $5 billion worth of materials in the stockpile in materials that are above what we have apparently decided is necessary. Why don't we sell the $5 billion and buy some of the things that we are short of?

Mr. PENDLEY. Mr. Chairman, we are trying to do that. The administration came forward and sought an authorization to dispose of the silver and the tin. The $2.1 million at the time was made up of the silver. We sought that authority and we received that authority. Then, in the Defense Appropriation Act, an amendment was attached that prevented us from continuing to dispose of silver.

Mr. BROWN. That is because of the concern of certain Members of Congress over the stability of the price of silver.

Mr. PENDLEY. Yes, sir. And with regard to the low prices.

Mr. BROWN. Has that anything to do with the Bunker-Hunt situation?

Mr. PENDLEY. I have no idea, Mr. Chairman.

Mr. BROWN. Looking at one of these in particular where I have had some experience over the years where we need a little R. & D. help in this country to improve our defense posture, that is the rubber situation. We are short over $1 billion in rubber from the targets. There is no shortage of rubber; it is just that we depend on a long supply line. One of the alternatives that we tried in World War II is developing a domestic rubber supply.

Are any of you able to speak as to what is happening in rubber right now?

Mr. WILSON. I know the Department of Agriculture is working on guayule as a potential substitute for that, but I am not sure of the status.

Mr. BROWN. Do you know whether the Defense Department is seeking to establish a purchasing program for guayule rubber?

Mr. WILSON. No, I don't.

Mr. BROWN. Do any of you know?

Mr. FOSTER. The Department of Defense has a guayule program that it is looking at which has been recommended by the Joint Logistics Commanders. We are examining that right now. We had a proposal from FEMA to OMB which was denied recently.

Mr. BROWN. That was a $200 million grant program to acquire guayule stockpile?

Mr. FOSTER. It was for domestic natural rubber capability.

Mr. BROWN. There is a considerable amount of development work that has to be done on guayule. Anyone who is familiar with guayule is well aware of that. I am just wondering—we don't have any guayule experts on this panel, I guess.

Another matter of personal interest—we will move off this subject since I am not getting much help, anyway—I have been concerned about the possibility for a number of years of recycling. I am reminded of an old article that Glen Seaborg wrote years ago called "The Recycled Society," or something like that, in which he suggested certain methodologies which would be used to identify that materials that went into things so that they could be more

easily recycled and he developed this at some length. But the essential point is that we waste too much stuff in this society. The military and the Federal Government is one of those that wastes a lot of this.

Are any of you aware, in connection with research on material policy, as to whether or not efforts are being made to engage in research and development of processes which could lead to the greater recycling of some of these scarce materials?

Mr. WILSON. The National Bureau of Standards at the Commerce Department is working with the American Society of Metals on workshops later on in the year to look at reprocessing, conservation and recycling. The workshops will be held on two different levels, the managerial level and the technical level. They are to be used basically as information gathering and dissemination to show businesses why it is more profitable to invest in recylcling than perhaps some other method. So that research and those types of information exchanges are being planned.

Mr. BROWN. Mr. Chairman, I have no further questions.

Mr. GLICKMAN. I would like to follow up a little bit on what Mr. Brown said. I am going to read you something, and then I am going to refer it to a specific issue for your comments.

"Several policy areas appear to have been given major attention in the President's Report"—talking about the report that you submitted—"mineral development on Federal lands, deregulation, Cabinet Council policymaking, coordination, and administration economic policy. Yet, these policy areas were given relatively little attention in the guidelines offered by the Act: land policy, sections 3(7) and 5(e)(3); deregulation; section 4(8); and Cabinet Council coordination, section 5(a)(1)(D). Thus, the report may seem to be, to some extent, as a vehicle for promoting current administration policy issues rather than a complete response to the requirements of the act. This view may be supported by the number of areas of concern that were raised by the act, but essentially ignored in the report: scientific and technical engineering manpower needs, especially for research and development and critical materials areas; the need for long-range assessments of minerals and materials needs and requirements, preferably for 5, 10, 25 years; the need for increasing mining and metallurgical research capabilities by the U.S. Bureau of Mines; the need for greater attention to resource recovery, recycling, and waste materials disposal; and the need for an early warning system for materials supply and availability problems."

Comments?

Mr. PENDLEY. Mr. Chairman, I disagree. As I said in my statement in the summary of actions that we have undertaken, you can't do anything with regard to minerals policy unless you insure the availability of highly mineralized Federal lands, and the development of the mineral resources on those lands. Just as we found out at the time of the energy crisis, America is not energy poor; America is energy rich. America has domestic sources of minerals. And when those resources are economically viable and when the Government is not obstreperous in its attitude toward that development, then that development will take place and those materials

and minerals will be available for the American people. That is why we moved aggressively.

I think that the indication of the 1980 act and its restatement of the 1970 act directs the administration to do just that, and we have. We have increased our long-range data collection capability. We have improved the system in the Bureau of Mines. We have asked for increased funding for Bureau of Mines research, including, their recycling and substitution efforts. We are developing in the Bureau of Mines the capability for an early warning system to determine what eventualities may cause dislocations and lack of supply.

So I think the statement is incorrect. I think we have been responsive, and we are moving ahead to remedy the problems that the act foresaw.

Mr. GLICKMAN. Well, let me tell you what concerns me. First of all, you talked almost exclusively about minerals until the end. I guess what concerns me is this: If we have a policy that is devoted exclusively to opening up the public lands and mining cobalt in Yellowstone National Park——

Mr. PENDLEY. Mr. Chairman, I object. Mr. Chairman, the Secretary has said time and time again there will be no mining in the parks, there will be no timber cutting in the parks. The law forbids it, Mr. Chairman. I think this is the type of thing that has unfairly characterized the Department of Interior's activities. We will not mine in the park, Mr. Chairman.

Mr. GLICKMAN. All right. You can object all you want to, but I am still going to raise my question.

My question is: If the policy is geared towards mining, whether it be in parks or whether it be in areas of the country that might have been generally deemed to be pristine until this time, or if the policy is geared towards reviewing lead standards under OSHA or asbestos standards which is contained as a potential policy in the addendum to the President's report—you have OSHA lead standards, regulations, need for reform, means of abatement very costly, review to focus on cost effective approaches, OSHA asbestos standards, reviewing scientific evidence on asbestos under review—when are you going to deal with the major concerns of materials policy?

I guess what concerns me is if this is the way that we are going to achieve critical materials independence, as opposed to pursuing substitution and R. & D. and some of the "more long-term and difficult" type of ways of achieving it, then I am not sure that strategy is going to be agreed to by a majority of the people in this country.

On the other hand, I fully realize that some of the regulations on deep seabed mining and some critical issues need to be reviewed. But I guess what my point is is that if the Cabinet-level Council in pursuing this problem is going to neglect critical areas in order to eliminate lead standards or asbestos standards and is going to mine America and neglect materials substitution—we have a problem. The issue we are facing is materials and their use. That is what we are talking about. We are talking about building airplanes and building bombs and building tanks and building cars, and not rocks, so to speak. If we pursue only these other matters we don't end up with any materials policy. I guess that is the point I make.

Mr. Wilson, did you have a comment there?

Mr. WILSON. Mr. Chairman, it is not a mining policy. The statement contained, in addition to land availability, sections on research and development, minerals data collection and stockpile policy. It is very comprehensive. So I take issue with you on that.

I would argue in what you said a moment ago about this policy statement being a foundation for other administration policies. The materials and minerals problem is a subset of the national economy. And some of the things that we have done, including the accelerated cost recovery system, the tax credit, the general economic recovery program that we have put in place, goes to the very heart of changing the structural causes of this problem. So I believe it is a very comprehensive statement. I don't believe it is a springboard for other policies. But it is included within other national policies. It is a national problem and is part of the national economic problem.

Mr. GLICKMAN. Mr. Marcum, do you have any comments?

Mr. MARCUM. Yes. I would like to, first of all, say, Mr. Chairman, I have to excuse myself in just a few minutes. So let me make this comment, and if there are any other specific questions of me, I would be happy to answer them before I have to leave.

I agree completely that this is a comprehensive policy. I think the way you were characterizing it represents a very selective reading of it. In fact, there is a very considerable emphasis in this program plan on research and development, on materials substitution and on rapid solidification technology. This administration, through the Department of Defense, through the Department of Commerce, and the Department of Interior, has conducted a number of workshops in each of these areas, with considerable emphasis in our budgetary allocations in these areas, and you will see in the upcoming activities of the Federal Coordinating Council and the COMAT a very vigorous examination of existing Government programs to insure that there is proper emphasis on research and development of a character which might solve some of the problems that you mentioned; that is, longer-term research which really is fundamental to solving some of these problems.

Mr. GLICKMAN. You are not going to ignore things such as Mr. Brown talked about in terms of recycling and those kinds of issues? I guess what concerned me as I read this report is some of the things which you have just stated were part of policy were really not explicit in the report itself.

Mr. MARCUM. Well, it is certainly our intention to make them very explicit in the implementation——

Mr. GLICKMAN. And to be high priority.

Mr. MARCUM. That is right.

Mr. GLICKMAN. Mr. Brown?

Mr. BROWN. As long as Mr. Marcum is taking responsibility for all the R. & D.—we have had a native rubber R. & D. bill on the books for several years. This Administration has proposed reducing the funding for it. Yet, we are short over $1 billion worth of natural rubber highly necessary for defense purposes, aircraft tires, that sort of thing, in the inventory.

It doesn't sell with me to say you have an aggressive R. & D. program when you are not even following the authorizing legislation

and requesting money to carry on a program in an area vital to national defense. Believe me, I am serious about this.

Mr. GLICKMAN. Let me ask you this one question because I know you have to leave, and I think it is more relevant for you than anybody else: Congress, both in the 1980 act as well as H.R. 4281, continues to endorse the concept laid down by virtually every study commission during the past 30 years that national materials policy should be coordinated through the Executive Office of the President. Nonetheless, the administration continues to prefer that such coordination take place through the Cabinet Council on Natural Resources and Environment.

What do you see as the major objections to carrying out such coordination within the Executive Office, and what do you see as the major benefits in the use of the Cabinet Council?

Mr. MARCUM. First of all, let me say that there are two organs within the Executive Office of the President that will be carrying out a review of materials and minerals policy questions. One is the Federal Coordinating Council on Science and Engineering Technology, and its subsidiary group, COMAT, which I mentioned, that is chaired by the science advisor to the President, that is housed within the Executive Office of the President and will be used as the principal vehicle for review of certain development programs.

The real utility within the Cabinet Council, which, incidentally, is also within the Executive Office in the sense that it is chaired by the President and chaired in his absence by the Secretary of the Interior or by other Cabinet officers, is that it provides a standing mechanism to resolve those policy issues which cannot be readily resolved through the interagency coordinating process that would be available in the normal budgetary review or FCCSET/COMAT sort of review that we do have. So I think the existence of both of these mechanisms provides and opportunity for day-to-day coordination, oversight, research and development direction and for Cabinet level and presidential attention to those policy issues which require that level of attention and consideration.

Mr. GLICKMAN. OK. But you state that H.R. 4281, Mr. Fuqua's bill, would cause inefficiency and delay in materials policy and coordination—or at least I think that was implied. Maybe I am putting words in your mouth.

But the current policy came to us about 6 months late. I guess what I am concerned about, and you can respond to me, is how could the Cabinet Council be more inefficient than the current bureaucracy?

Mr. MARCUM. I think the question is: How can it be more efficient than the current bureaucracy? First of all, the Cabinet Council, of course, is not part of the bureaucracy; it is in fact a constituent group of presidential appointees who head the various departments and agencies which are members. Its function, again, is to resolve issues which require interagency arbitration or presidential consideration.

Our report—you mentioned repeatedly that it is 6 months late. Our report, in our view, is a prompt report. It is the result of a very extensive and comprehensive review within this Government. I certainly second Mr. Pendley's comment that it is a very funda-

mental and important review that has not been accomplished in several previous administrations.

Mr. GLICKMAN. A final question for you: Your statement notes consideration of more cost effective approaches for mine safety, noise standards, et cetera. Could you elaborate on what you mean by more cost effective?

What concerns me is the OSHA standards and the need for reform reviewing scientific evidence on asbestos. Are you contemplating eliminating the asbestos standards?

Mr. MARCUM. No. But, again, I would not want to prejudice the outcome of the reviews that are mentioned in there. I think the cost effectiveness is a very desirable goal and it implies a proper balancing of economic and other societal complications of regulatory procedures.

Mr. GLICKMAN. OK.

Mr. Shamansky, you have no questions.

Mr. Brown, do you have any additional questions?

Mr. BROWN. No, Mr. Chairman.

Mr. GLICKMAN. OK.

There may be questions from members who were not here, so we may have additional questions for you. There may be some specific questions for DOD, particularly on some of it, to the extent that it is not classified, on some of the specific material. We appreciate your testimony, and if additional questions come in, we would ask you to respond to them.

Mr. PENDLEY. Thank you, Mr. Chairman. We will be responsive.

Mr. GLICKMAN. Our next panel of witnesses is Mr. Stanley Margolin, Federation of Materials Societies—I think you are accompanied by some folks and they may sit with you at the table, if you wish, Mr. Emanuel Horowitz, Mr. Michael Deutch and Mr. Nathan Promisel. In addition, we have Hope M. Babcock, deputy counsel, National Audubon Society. Formerly, I believe, you were Deputy Assistant Secretary for Energy and Minerals at the Department of the Interior, during 1977 and 1979.

Mr. Margolin, why don't you proceed first. The entire statement of all of the witnesses will be printed in the record in their entirety, so you may feel free to summarize.

STATEMENTS OF STANLEY V. MARGOLIN, FEDERATION OF MATERIALS SOCIETIES, ACCOMPANIED BY EMMANUEL HOROWITZ, VICE PRESIDENT, FEDERATION OF MATERIALS SOCIETIES; AND HOPE M. BABCOCK, DEPUTY COUNSEL, NATIONAL AUDUBON SOCIETY

Mr. MARGOLIN. Thank you, Mr. Chairman.

Mr. Chairman and members of the subcommittee, I am Stanley V. Margolin, immediate past president of the Federation of Materials Societies and Chairman of the FMS Government Liaison Committee. Accompanying me is Emanuel Horowitz, first vice president of the Federation. Unfortunately, Michael Deutch and Nathan Promisel, who were participants in the preparation of this statement, could not be here today.

FMS is a consortium of 14 technical societies whose members represent nearly 750,000 professionals with materials expertise from industry, academia, government and private consulting.

Our remarks today reflect views developed at a colloquium on "The National Policy Agenda for Strategic Minerals and Materials" sponsored by the FMS and the National Society of Professional Engineers on February 2 in this city this year. The colloquium brought together materials professionals from the FMS constituent societies, Members of Congress and their staffs, Executive Branch personnel, industry and academia.

We commend the subcommittees for holding these hearings on national materials policy. FMS is proud to have participated in development of the National Materials and Minerals Policy, Research and Development Act of 1980, and stands ready to assist in the implementation of materials and minerals policy. Without passing judgment on the President's April 5 message to Congress, we note that this is the first administration in 30 years to issue a key statement on the importance of materials to the economy and security of the United States. We are reviewing the President's statement and will be discussing this subject at the FMS conference on Strategies for Coping with Critical Issues Related to Engineering Materials and Minerals to be held at Harpers Ferry, W. Va., in July. Your staff will be participating in this conference, and they and we will keep you informed of the outcome.

Major issues which arose out of the February 2 colloquium and will form the basis for the Harpers Ferry conference include the following:

One, materials are a vital national problem with implications for defense preparedness and retardation of economic recovery and growth.

Two, the materials problem contains financial, structural and institutional components which the materials industry cannot resolve by itself. This is evidenced by the migration of our basic industries overseas. Our steel industry is declining. Our ferrochrome industry is declining. We are exporting copper ore for foreign processing. These are hemorrhages which are not being stemmed.

Three, in defense considerations, increasing complexity of military weapons leads to greater dependency on sophisticated materials. In some of these critical materials, we already have entered into excessive and risky dependence on interruptable foreign

sources. Because of the uncertainty of future demand, there is no economic incentive for domestic companies to invest in new facilities to produce and process these materials. A prime example is the titanium capacity of this country.

Four, because of early initiatives in certain technologies and heavy investment in processes and equipment, U.S. industry is locked in a mode that requires updating to increase productivity. Foreign competition has the advantage in this context.

Five, there are cooperative arrangements between government and industry abroad—particularly in Japan, but also in Germany, France and Great Britain—which enhance the economics, productivity and competitive effectiveness of foreign industry. That kind of industry/government relationship—which does not currently exist in the United States—may require some parallel if U.S industry is to remain competitive both at home and abroad.

Six, the United States must emphasize the development of advanced high technology materials with improved performance characteristics to satisfy the demands of high technology industries such as energy, transportation and communication.

Seven, the totality of our foreign policy must be sensitive to our dependence on countries, friendly and unfriendly, stable and unstable, for so much of our materials and minerals needs. International trade agreements, the Law of the Sea Treaty, import and export policy, technical specifications, technology transfer—these and many other considerations are vital, interacting factors that affect the availability of our needed materials and minerals. Many of these factors must be more fully recognized by government officials who exercise control over them.

Eight, there is a need to assess the adequacy of the list of identified materials for storage in the stockpile to make certain that they meet current and future needs. The quality, quantity and form of the materials in the stockpile must meet specification requirements which enable them to be utilized on a timely basis as needed.

Nine the United States must evaluate its materials processing capacity and capability to determine whether it is adequate for converting materials—including those in the stockpile—into products required for national defense needs.

Ten, the United States must develop a better understanding and data base for current and future requirements for science and engineering graduates to meet increasingly complex industrial and defense needs.

Eleven, there is concern that the Nation may not be producing an adequate supply of technologists, vocationally trained personnel and support people to operate the equipment and facilities required by industry.

Twelve, the United States must greatly expand constructive relationships between academia and industry.

Thirteen, problems related to the role of the materials life cycle in the field of energy need to be redefined in light of changes in technology and the economy.

Fourteen, because of bureaucratic vagueness, the existing legislation relating to materials has not been implemented. Government activities in the materials arena must be better defined and coordinated.

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In conclusion, the United States needs a more coherent, comprehensive, definitive materials and minerals policy, and a plan and program with appropriate priority and means to achieve this policy. The February 2 colloquium on which this statement is based clearly raised these needs and the necessity for technical input into government regulatory decisionmaking. The Federation of Materials Societies stands ready to assist in this important task.

With my statement is a list of the societies who are members of the Federation.

Mr. GLICKMAN. Thank you, Mr. Margolin, for an excellent statement.

[The prepared statement of Mr. Margolin follows:]

STATEMENT OF THE
FEDERATION OF MATERIALS SOCIETIES
ON NATIONAL MATERIALS POLICY

before the
Subcommittee on Science, Research and Technology
and the
Subcommittee on Transportation, Aviation and Materials

April 20, 1982

Chairman Walgren, Chairman Glickman, members of the Subcommittees, I am Stanley V. Margolin, immediate Past President of the Federation of Materials Societies and Chairman of the FMS Government Liaison Committee. Accompanying me are Emmanuel Horowitz, first vice president of FMS; and Michael Deutch and Nathan Promisel, members of the FMS steering committee which prepared this statement. FMS is a consortium of fourteen technical societies whose members represent nearly 750,000 professionals with materials expertise from industry, academia, government and private consulting.

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Major issues which arose out of the February 2 colloquium and will form the basis for the Harper's Ferry conference include the following:

SCOPE OF THE PROBLEM

1. Materials are a vital national problem, with implications for defense preparedness and retardation of economic recovery and growth.

2. The materials problem contains financial, structural and institutional components which the materials industry cannot resolve by itself. This is evidenced by the migration of our basic industries overseas. Our steel industry is declining. Our ferrochrome industry is declining. We are exporting copper ore for foreign processing. These are hemorrhages which are not being stemmed.

3. In defence considerations, increasing complexity of military weapons leads to greater dependency on sophisticated materials. In some

of these critical materials, we already have entered into excessive and risky dependence on interruptable foreign sources. Because of the uncertainty of future demand, there is no economic incentive for domestic companies to invest in new facilities to produce and process these materials. A prime example is the titanium capacity of this country.

FOREIGN COMPETITIVE ADVANTAGES

4. Because of early initiatives in certain technologies and heavy investment in processes and equipment, U.S. industry is locked in a mode that requires updating to increase productivity. Foreign competition has the advantage in this context.

5. There are cooperative arrangements between government and industry abroad -- particularly in Japan but also in Germany, France and Great Britain -- which enhance the economics, productivity and competitive effectiveness of foreign industry. That kind of industry/government relationship -- which does not currently exist in the United States -- may require some parallel if U.S. industry is to remain competitive both at home and abroad.

6. The U.S. must emphasize the development of advanced high technology materials with improved performance characteristics to satisfy the demands of high technology industries such as energy, transportation, and communication.

FOREIGN POLICY CONSIDERATIONS

7. The totality of our foreign policy must be sensitive to our dependence on countries friendly and unfriendly, stable and unstable, for so much of our materials and minerals needs. International trade agreements, the Law of the Sea treaty, import and export policy, technical specifications, technology transfer -- these and many other considerations are vital, interacting factors that affect the availability of our needed materials and minerals. Many of these factors must be more fully recognized by government officials who exercise control over them.

STOCKPILE ISSUES

8. There is a need to assess the adequacy of the list of identified materials for storage in the stockpile to make certain that they meet current and future needs. The quality, quantity and form of the materials in the stockpile must meet specification requirements which enable them to be utilized on a timely basis as needed.

9. The U.S. must evaluate its materials processing capacity and capability to determine whether it is adequate for converting materials -- including those in the stockpile -- into the products required for national defense needs.

EDUCATION AND MANPOWER

10. The U.S. must develop a better understanding and data base for

current and future requirements for science and engineering graduates to meet increasingly complex industrial and defense needs.

11. There is concern that the nation may not be producing an adequate supply of technologists, vocationally trained personnel, and support people to operate the equipment and facilities required by industry.

12. The U.S. must greatly expand constructive relationships between academia and industry.

ENERGY

13. Problems related to the role of the materials life cycle in the field of energy need to be redefined in light of changes in technology and the economy.

INSTITUTIONAL CONSTRAINTS

14. Because of bureaucratic vagueness, the existing legislation relating to materials has not been implemented. Government activities in the materials arena must be better defined and coordinated.

CONCLUSION

The United States needs a more coherent, comprehensive, definitive materials and minerals policy, and a plan and program with appropriate priority and means to achieve this policy. The February 2 colloquium,

on which this statement is based, clearly raised these needs and the necessity for technical input into government regulatory decision-making. The Federation of Materials Societies stands ready to assist in this important task.

The members of FMS are:

American Association of Crystal Growth

American Ceramic Society

American Chemical Society

American Institute of Chemical Engineers

American Institute of Mining, Metallurgical & Petroleum Engineers

American Society of Mechanical Engineers

American Society for Metals

American Society for Testing and Materials

The Electrochemical Society, Inc.

Institute of Electrical & Electronic Engineers

National Association of Corrosion Engineers

Society of Manufacturing Engineers

Society of Plastics Engineers

Electric Power Research Institute (Observer Society)

STANLEY V. MARGOLIN

Mr. Margolin is a senior staff member of Arthur D. Little, Inc. He received a B.S. in Chemical Engineering and a M.S. in Chemical Engineering Practice from the Massachusetts Institute of Technology.

Mr. Margolin was associated for three years with E.I. duPont de Nemours & Co., Inc. where he did process design work dealing with the design, procurement, and construction of chemical plants.

Mr. Margolin became a member of the professional staff of Arthur D. Little in 1953 and since that time his work has covered a wide range of chemical engineering, process metallurgy, technical, economic and environmental studies. Among his activities for Arthur D. Little are process development studies involving metals and minerals, fuels, process engineering, engineering studies involving chemicals, metals and minerals, building materials, and energy. He has been active in analyses of regional areas for the exploitation of minerals, both metallic and non-metallic, as applied to basic industries. He has been active in siting studies for various types of basic operations.

Mr. Margolin's participation in economic and technical evaluations undertaken for client companies has resulted in many successful avenues of industrial diversification. His leadership on research and development programs has led to process and production innovations which have been patented.

Mr. Margolin has been associated with the energy industry and in particular solid fuel processing and development of technology. He was responsible for the development and construction of processes for the production of smokeless fuels from lignite and wood sources. He was responsible for a program of development work on the Athabasca tar sands. More recently, he has been active in conducting studies on the conversion of coal to various products including gas, liquid, and solid.

He has been active in air pollution control and stream pollution abatement, and the recovery of valuable materials from waste effluents. He has coordinated and led a great number of studies for the U.S. Environmental Protection Agency on economic impact, including the analysis of air standards on the nonferrous industry, and the analyses of impact of water standards on the nonferrous industry, asbestos, and mining industries. He was project manager of the large American Iron and Steel Institute study, "Steel and the Environment - A Cost Impact Analysis." He was responsible for a large study dealing with the value of research done in the areas of health effects of air pollution and another study dealing with the implications of research and legislation on air pollution control. He has been responsible for major environmental impact studies of both steel mill expansions and U.S. Steel's proposed new steel mill at Conneaut, Ohio. He has been active in studies dealing with future research and

STANLEY V. MARGOLIN (Continued)

development in the steel industry and assessment of diffusion of steel technology in the industry.

A Registered Professional Engineer in Massachusetts, Mr. Margolin is a member of the American Institute of Mining, Metallurgical and Petroleum Engineers, the American Mining Congress, American Iron and Steel Institute, National Coal Association, National Association of Manufacturers Environment Committee, and the Environment Committee of the Business Industry Advisory Committee to OECD. He is also a Fellow of the American Institute of Chemists and the American Institute of Chemical Engineers. He is immediate Past President of the International Briquetting Association and is also immediate Past President of the Federation of Materials Societies.

Mr. GLICKMAN. Ms. Babcock, why don't you proceed.

Ms. BABCOCK. Thank you, Mr. Chairman.

I would like to take advantage of your offer to put my full testimony in the record, and I have prepared a summary which I would like to give now.

I appreciate this opportunity to discuss with you today National Audubon Society's concerns about public lands protection and mineral development activities. I would also like to discuss recent legislative proposals that affect that issue, including H.R. 4281 and the administration's April 5, 1982, National Materials and Minerals Program Plan and Report to Congress. As you will see, ours is a slightly different perspective on the problem.

An organization of nearly half a million members, the National Audubon Society has become increasingly involved in the issues surrounding U.S. strategic mineral supplies. Our growing concern stems from the fact that the strategic mineral supply has become a factor in the debate over protection of our public lands. As an expression of this concern, National Audubon joined with six other national conservation organizations to prepare a report on strategic minerals issues and public land policy which we released last October. I would like to ask, with your permission, that the executive summary of that report, which is approximately 11 pages, be included in the record at this hearing.

Mr. GLICKMAN. Without objection, it will be included.

Ms. BABCOCK. Thank you.

[The summary follows:]

Introduction and Summary

Over the last few years the subject of strategic minerals has increasingly become an issue of national debate. We have heard forceful rhetoric about a "minerals crisis" and the implied need to open virtually all public lands, including wilderness areas, for development. Our organizations:

Environmental Policy Center
Friends of the Earth
National Audubon Society
National Wildlife Federation
Natural Resources Defense Council
Sierra Club
The Wilderness Society

believe strategic minerals to be an important national issue. We have been concerned about the tenor of the debate, and this briefing book represents our analysis of critical aspects of the strategic minerals issue.

Strategic minerals policy has two components which are of long-term national consequence:

- national security
- public land use and resource policy

We have tried to clarify the national interest in both of these areas as they relate to strategic minerals policy.

To accomplish this, we addressed a number of issues which we believe are the focus of public concern:

-- the extent and significance of U.S. dependence upon foreign sources for strategic minerals;

-- the stability of exporting nations, the size of U.S. stocks and stockpiles, and the potential for domestic production;

-- whether or not there is evidence of a "resource war" being waged by the Soviet Union;

-- whether or not there is a massive and unwarranted resource "lock-up" of public lands;

-- proposed legislation and the Reagan Administration's plans for strategic minerals and public lands policy.

Following are a series of questions and the answers which resulted from our analysis. They appear in the order of the sections in the briefing book.

Domestic Production and Needs

Q. Is the U.S. so dependent on foreign strategic minerals that national security is threatened?

-- Of 10 of the major strategic minerals used in the U.S., we are net exporters of 2 (lead and molybdenum), and we import 4 from stable, friendly western hemisphere nations. The remaining 4 (chromium, cobalt, manganese, platinum) come from nations considered unstable or unfriendly. Being dependent, however, even on those nations considered unstable, is not the same as being vulnerable. Minerals for which we are extremely dependent are stockpiled in significant quantities. Although the stocks in some cases are below the U.S. 3 year goal, the combination of industrial stocks and government stockpiles in most cases contains several years' supply. Furthermore, since strategic use of most of these minerals constitutes only a small percentage of their total use, these stocks and stockpiles could last much longer in a critical situation.

Q. Why are greater quantities of needed minerals not produced in the United States and wouldn't greater access to public lands increase domestic production?

-- There are two primary reasons why minerals are not produced in the U.S. in greater quantities:

1. Either they do not occur here in great quantities, or it is cheaper to produce them in other countries.

2. The U.S. has lost much of its mineral processing capacity in recent years.

Thus, opening more public lands will not necessarily result in more mineral production. Public lands, for the most part, are open to mineral development. The Blackbird area in Idaho is an example which combines both the economic and the public lands factors. The Blackbird area has high potential for cobalt and was designated non-wilderness for the purpose of mineral activity. Blackbird mining claims are held by a Canadian company which is seeking a government subsidy for its operations because of "soft" world prices for cobalt. If the Blackbird cobalt were produced, there is no assurance that it would be sold to U.S. purchasers.

Foreign Dependence in Perspective

Q. Does U.S. dependence on unstable trading partners for some strategic minerals create a major national security problem?

-- This question is considered in our text in light of three factors: (1) what quantities of key non-fuel minerals do we import, (2) how stable are the exporting countries upon which we rely, and (3) what other sources or substitutes are available for those minerals we must import from unstable sources?

Our analysis indicates that U.S. dependence does not seriously affect our national security. Net import reliance data show that the U.S. has, for the most part, stable trading partners from whom we can continue to import large quantities of the minerals and metals we need for industrial and defense purposes.

Q. Although total self-sufficiency would be impossible, isn't it in the United States' best interests to become as self-sufficient as possible?

-- Practical considerations dictate that on balance, total self-sufficiency is not a desirable objective. Depletion of America's resources would ultimately leave the U.S. at the mercy of other suppliers. Furthermore, the withdrawal of the U.S. from international supply relationships could disrupt the worldwide economy, as well as our own. In situations where U.S. imports are unstable, alternative sources, substitutable commodities, and conservation methods all offer important options for avoiding vulnerability.

Q. Is a "resource war" being conducted against us by the U.S.S.R.?

-- Many experts on foreign affairs argue that not only is the Soviet Union not engaged in a "resource war" in southern Africa or elsewhere, but that economic constraints would make such a "war" virtually impossible. Their analyses indicate that the Soviets are neither attempting to deny minerals to the West as a political strategy, nor are they seeking to control world supply for their own needs. Our text quotes from some of these sources at length.

Domestic Resources: An Overview of Current Information

Q. Is the U.S. "locking up" badly needed strategic minerals by not allowing development on public lands?

-- Over 400 million acres of public lands are fully open to mineral development. And most of the rest is open to at least some mineral activity. Even wilderness areas which constitute only 3.4% of the total U.S. land base, are to remain open until January, 1984, and beyond that date even full development is permissable on valid existing claims and leases. Despite the fact that most public lands are open to development, in 1977 less than 1/3 of non-fuel mineral development came from public lands.

It is important to note that, of the 60 areas in the National Forest System which have been analyzed as part of the wilderness study process, only 5 have been indentified as having high mineral potential. None of the minerals identified in these 5 areas are minerals for which we are heavily dependent on unstable or unfriendly countries. Of the 13 Bureau of Land Management wilderness study areas for which mineral surveys have been completed, none has significant mineral potential, 2 have moderate potential (for zeolite and gypsum). While some areas of public lands have not yet been assessed for mineral potential, several things are clear --

1. The vast majority of public lands are open for development.

2. Some of our most environmentally sensitive areas, such as many wilderness areas, do not contain significant quantities of strategic minerals.

3. Our parks, refuges, and wilderness areas are uniquely valuable. They should be sacrificed only if there is no alternative.

The Public Lands and Mineral Development: Availability and Regulation

Q. Isn't mineral exploration blocked by the wilderness designation process?

-- The Wilderness Act provides that mineral prospecting may be allowed indefinitely if "compatible with preservation of the wilderness environment." Wilderness areas are not great storehouses of

minerals mostly because boundaries have been drawn to exclude potential mineral deposits, not because restrictions have barred development. In National Forests, areas with high mineral potential in proposed wilderness areas have been exluded from wilderness designation. The Federal Land Policy and Management Act (FLPMA) contains specific provisions to accomodate mineral concerns as part of the BLM wilderness review process. It mandates a special USGS/Bureau of Mines mineral survey on any area being recommended for wilderness; it fully protects existing mineral rights; it protects "grandfathered" mineral activities which existed prior to enactment. It also leaves wilderness study areas open to establishment of new mining claims and leasing, and it allows for new activity which creates only "temporary" impacts of up to 10 years. Of the 338 million acres administered by the BLM, 91 percent have already been released for development.

Q. Does it make sense to withdraw lands from development simply for environmental reasons?

-- Lands are withdrawn for a variety of reasons, only a few of which are strictly environmental. Lands are withdrawn for watershed projects, powersites, administrative sites, township/municipality requests, military installations, stock driveways, irrigation projects, and experimental stations, to name a few. Less than 28% of the federal lands are withdrawn from claim staking and less than 22% from leasing for environmental reasons. Withdrawal of public lands for public recreation and wildlife protection is just as valid as any of the other reasons for withdrawal. In fact, withdrawing lands for broad, public multiple use is likely to benefit more citizens than most of the other uses.

Q. Why does industry complain that federal leasing and permitting procedures unduly restrict fuel and non-fuel mineral industry activity?

-- Industry officials contend that the Interior Department's leasing and permitting procedures unduly restrict access and increase costs. However, in a February, 1981 report, the General Accounting Office outlined steps necessary to increase oil and gas development on federal lands. GAO's statistics showed that the primary delay in the approval process for applications for permits to drill for oil and gas was "the time taken by applicants to submit information to the Survey." The conclusions of this report may be assumed to apply to mineral leasing as well.

Conservation Alternatives to Foreign Dependence

Q. To what extent are there practical alternatives?

-- Numerous alternatives, applicable to all sectors of the minerals economy, hold promise for extending our resource base:

- Many of the innumerable tons of valuable metals lost to landfills and scrap piles can be recycled.
- More readily available materials can be substituted for less accessible materials.
- New manufacturing technologies may reduce the need for certain strategic minerals.
- Mining and recovery techniques can be improved to increase yield.
- Product designs can be refined to decrease the amount of metal consumed.

Q. What specifically needs to be done to hasten implementation of conservation alternatives?

-- Research called for under the National Materials and Minerals Policy, Research, and Development Act of 1980 should be expedited.

Methods for encouraging or requiring recovery and recycling of strategic minerals should be developed.

New techniques to improve the yield from mining and processing operations should be developed.

Comprehensive and continuing studies to find substitutable minerals should be a national priority.

Studies of the economic and technical viability of various conservation methods should be undertaken.

Metal-by-metal estimates of the impacts that alternatives might have on America's ability to decrease dependence on foreign strategic minerals should be undertaken.

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Conclusions and Recommendations

These questions and answers have led us to several conclusions. While the U.S. is dependent for some strategic minerals on foreign nations, most of the nations from whom we import are our friends or allies and are stable. For those few strategic minerals for which we depend on unstable or unfriendly countries, we have several years supply in stocks and stockpiles. Furthermore, we have seen no conclusive evidence that any "resource war" exists, and much evidence to the contrary. In fact, if the U.S. cuts off its supply relationships with trading partners, we are likely to weaken existing alliances and harm our own and others' economic position.

Arguments that public lands are "locked up" and should be opened immediately for unrestricted mineral development are respectively wrong and unwise. Most public lands are in fact open to development. Little mineral activity is found in wilderness areas because most of their boundaries have been drawn to exclude significant mineral deposits. Wilderness study areas are subject to industry exploration and continuing surveys to determine mineral potential.

Many strategic minerals are not developed in the United States either because they are not to be found here in significant quantities (for example, we have no identified economically developable manganese reserves) or because it is considerably cheaper for industry to produce those minerals elsewhere.

We conclude that there is no compelling reason to open public lands which are not already accessible to mineral development. Our public lands belong to all Americans. In those few areas where mineral activity has been limited, it is only where other important uses of the land or critical national resources would be destroyed by unrestricted development.

Our long history of multiple use of federal lands has been based on shared access for all Americans. This includes recreationists, farmers, ranchers, historians, scientists -- as well as timber, oil and mining companies. The truth is that mining is a private use of public land. Of all those uses mentioned above, mining is the only use which makes the area in which it occurs essentially unusable for any other purpose. Where mining occurs multiple use is usually impossible.

Our conclusions have led us to a position of unanimous opposition to H.R. 3364, The National Minerals Security Act of 1981, and to attempts by the Administration to open additional public lands for mineral development.

We oppose H.R. 3364 for many reasons:

-- The bill through the national minerals policy and minerals council which it would establish, would grant sweeping authority to the Secretary of the Interior.

-- Under provisions of the bill the minerals council would be staffed primarily by volunteers. These "volunteers" could only come from industry, since no one else could afford to pay people to "volunteer" to work for a government agency. This would simply be an industry lobby within government.

-- The bill would elevate mineral development above all other uses of federal lands regardless of their importance. In fact, land use plans for BLM lands would be required to treat development of any significant mineral deposit as a "dominant use" Even lands with only marginal potential could be used for mineral purposes at the expense of other uses. This is entirely inconsistent with multiple use of public lands.

-- H.R. 3364 would overturn resource protection and development policies established by Congress over the course of the last century. It would give the Secretary absolute authority to grant mining industry access to any national part, wilderness area, or wildlife refuge, among other areas.

-- The bill requires the Secretary to request nominations for review of withdrawn lands and then to determine the suitability of any nominated lands for mineral location or leasing. On any federal lands where mineral location or leasing is found compatible by the Secretary, he is directed to apply the provisions of the general mining laws. This gives unprecedented, broad discretion to the Secretary to open "withdrawn, unrestricted, or closed" public lands to mineral entry. Given the inclinations of the current Secretary of the Interior, we have no reason to believe that any areas would be found incompatible.

-- The bill would further jeopardize our irreplaceable national wilderness system by making it open to mining until 1994, despite the fact that industry has already had 20 years to establish claims and leases in these areas.

Secretary James Watt, has identified the development and implementation of a minerals policy as a top priority of the Reagan Administration. The goals of such a policy were indicated in a draft Administration option paper dated August, 1981. According to this document the Administration is considering a number of legislative and administrative changes including:

-- amendments to weaken the Wilderness Act;

-- amendments to weaken the Federal Land Policy and Management Act;

-- a number of other proposals which are similar to those in H.R. 3364.

Our analysis and conclusions have prompted us to make a number of recommendations which we believe will contribute both to a sound minerals policy and to continued protection of our most valuable natural public lands areas.

1. Since trade relations and stockpile preparedness are essential to strategic minerals security, both should be enhanced.

2. Methods for encouraging or requiring recovery and recycling of strategic minerals should be developed.

3. The development of new techniques to improve the yield from mining and processing operations is important.

4. Comprehensive and continuing studies to find substitutable minerals should be a national priority.

5. A careful assessment of our domestic processing capacity should be done.

6. Exploratory information should be publicly disclosed to assist in the resource planning process.

7. The 1872 Mining Law should be modernized to assure environmental protection and to provide for equitable leasing systems.

8. Management criteria should be developed that make public lands which have been withdrawn for environmental reasons the last of the lands to be made available for mineral exploration and development.

We believe that H.R. 3364, combined with what the Reagan Administration has said about the need to develop minerals on public lands should be of great concern to all Americans, the owners of those public lands. We strongly believe that the national interests in both strategic minerals and public lands dictate the need for a reasoned public debate. We hope that this book will contribute to that reasoned debate.

Ms. BABCOCK. In that report, we looked at the assumptions and issues involved in domestic production of and need for strategic minerals, foreign dependence, and the availability of public lands to minerals development. We concluded that:

America is not hostage to the Soviet Union or any other country with respect to its mineral needs. In fact, for the most part, we depend for satisfaction of these needs on stable trading partners. This does not mean, of course, that our minerals needs should be considered as an element in our relations with the Soviet Union. However, our approach should be based on reality, not on inflammatory rhetoric. Self-sufficiency is neither a desirable nor practical national goal as it leads to depletion of our domestic resources and disruption in international trading patterns.

The domestic sources of most of these minerals are on private, not public, lands.

Less than 20 percent of the Nation's public lands have been withdrawn or in some way restricted for environmental reasons from mineral development activities. By far, the vast majority of withdrawals are for nonenvironmental reasons.

Pending legislation—and I would refer specifically to H.R. 3364 and H.R. 5603—and administration policy would unnecessarily open up wilderness areas to mineral development and disrupt the process of reviewing public lands for wilderness characteristics and mineral potential.

The National Audubon Society and the other national conservation groups have participated in the legislative debates surrounding increased access to mineral resources on public lands and have made many of these points before. Despite what our critics say, the environmental community is not at all desirous of taking positions which might in anyway jeopardize our national security. However, it is our assessment of the factors in the strategic minerals debate that acceleration of mineral development on public lands or weakening the regulations which provide protection for surface resources on these lands are unnecessary actions and are, in fact, not in the national interest.

Because we do not view public land availability as the villain in the problems besetting the strategic minerals industry, we strongly oppose efforts by this administration, as reflected in H.R. 5603 and the President's April 5 report to Congress, to accelerate or abort the orderly process of reviewing public lands for wilderness characteristics under the Wilderness Act, RARE II process and the Federal Land Policy and Management Act of 1976.

I think several points are worth noting with respect to the processes under those Acts:

Ninety-one percent of the 338 million acres of Bureau of Land Management lands have already been released to mineral activity, although the FLPMA review process is not yet complete.

Under the Wilderness Act of 1964, most national forest wilderness is examined for mineral potential prior to designation.

Of the 106 areas reviewed by the U.S. Geological Survey and the Bureau of Mines, strategic minerals in any amount greater than a trace were found in only 25 areas.

As wilderness areas have been established, many boundary accommodations have been made to assure mineral access by industry.

Finally, lands that are found not to have overriding wilderness value during the wilderness review process are released immediately for mineral exploration and development.

Our position on public land availability clearly places us at odds with the assumptions behind the National Minerals Security Act and the Wilderness Protection Act, as well as those behind the President's April 5 minerals report to Congress. Specifically, we are opposing these bills for the reasons that are set forth in my written testimony.

However, most of the elements in H.R. 3364 and H.R. 5603 are reiterated in the President's April 5 report to Congress, which causes us considerable distress. That is while we support the President's position on the need to continue to inventory public lands to determine their mineral potential we are disappointed at the continued focus on opening up these lands to mineral development, as well as at the idea of industry nominations becoming the driving force in classifying those areas.

We would have liked to have seen instead a strong policy statement by the President making public lands withdrawn for environmental reasons the last of the lands made available for mineral development activities, with a direction to the land management agencies to develop appropriate criteria implementing that policy and to incorporate those criteria into the planning processes mandated by FLPMA and the Resource Planning Act.

We do not believe that either the economy or the international situation, let alone the small amount of acreage we are talking about, justifies any single purpose focus on the Nation's public land to correct the perceived imbalance in our strategic minerals position or throwing aside the protections crafted by Congress of these critically important national resources.

We are also concerned about rhetoric in the April 5 report about eliminating barriers to the development of the mineral resources of the deep seabed, and want to be sure that those barriers are not those protecting this fragile environment or the safety of those who perform this work.

Similarly, mindful of the administration's record to date on reform of environmental regulations, we await with some anxiety—I would say bolstered by appendix A to the President's Report—the details behind any plan to reform "excessively burdensome or unnecessary regulations and statutes," which adversely affect the domestic minerals industry.

While individual cases may exist in which the public interest would be served by these kinds of changes, any sort of blanket approach such as that proposed in the April 5 report or set forth in the two bills that I have described previously, should be viewed with suspicion by this Congress.

We would also have liked to have seen greater attention paid to the need for a careful assessment of our domestic capacity to process these minerals—focusing on your concern, Mr. Chairman, about materials and the end of the process—as well as a realistic analysis of our international trading relations. We think there continues to

be too much emphasis on extracting the rock and stockpiling these materials and too little emphasis on improved processing and having the necessary trained manpower to perform the latter functions. Just having the materials on hand or in the ground will not help if we don't have the capacity to process those minerals.

We are disappointed that the April 5 report does not contain an explicit statement supporting expanded research on alternate methods of conserving, substituting and processing critical materials, including new manufacturing technologies, improved mining and recovery techniques and less mineral consumptive product designs.

We are concerned about public availability of the results of this research and ask this Congress to be sure that there be full public disclosure of the results of any research undertaken as a result of the April 5 report, consistent, of course, with our national security interests.

Finally, let me turn now to H.R. 4281, the Critical Materials Act of 1981, which proposes the establishment of a Council on Critical Materials. The clear intent of this proposed legislation is to tell the administration to get on with the business of implementing the National Materials and Minerals Policy, Research and Development Act of 1980. We commend Mr. Fuqua for this effort and for recommending the establishment of a Council on Critical Materials in the Executive Office of the President. While we may have concerns about the functioning of such a Council in this administration, we are confident that controls can be legislated to prevent its capture by the minerals industry.

Clearly there is a need to coordinate and pull together the diverse programs in the executive branch dealing with minerals and materials and the need to avoid unnecessary expense and overlap in these programs. We favor H.R. 4281 over the President's proposal that this function be fulfilled by the Cabinet Council on Natural Resources and the Environment because of the independence of the Council in the Executive Office of the President from existing departments. This independence will increase the Council's ability to advise the President and to compel coordination in these dispersed programs, just the concern that you were expressing, Mr. Glickman. An independent Council is also consistent with the recommendations of the 1980 act. I refer you to sections 3 and 4 of that act.

However, we are concerned that the Council not be staffed and funded in such a way as to create a bias towards the interests of the mineral industry. To counter that possibility, we suggest that one of the three members be representative of the public interest in protection of natural resources and the environment or that, alternatively, the staff of the Council be organized in such a way that that mandate can be carried out. We also request that the deliberations of the Council be open to the public and, to the degree that the Council's recommendations have enabling authority, that the formulation of those recommendations be subject to public notice and comment.

Use of formal advisory committees authorized in H.R. 4281 containing representatives, not just from industry, but from academia

and the public interest sector as well and public meetings can be useful in this regard.

We also recommend that language be added to the findings and purposes section of the bill—that would be section 2(a)—to assure consideration of environmental protection in the process of developing adequate supplies of strategic critical industrial material, and to assure consistency with the goals and purposes of environmental statutes such as the Wilderness Act. In that regard, we would like to see some recognition in H.R. 4281 of the importance of natural resources and the need to protect those resources for future generations while achieving our desired national goal with respect to supplies of strategic minerals and materials.

We would also like to see some mention in section 5 of the bill of the need to undertake research and furtherance of alternate methods of conserving, substituting and processing critical materials consistent with the directives contained in section 4 of the 1980 statute.

As this committee continues its deliberations on issues involving strategic minerals, we urge you to refine a working formula which helps to identify critical mineral and materials supply problems. We are concerned, obviously, about the scope of that definition.

As members of this committee are aware, materials are defined in the 1980 National Materials and Minerals Policy, Research and Development Act to include those needed for "industrial, military, and essential civilian needs." The Federal Emergency Management Agency has the responsibility for coordinating with other agencies to produce a list of strategic materials for stockpile purposes. We would urge that such strategic materials be limited to those critical to our Nation's defense industrial base.

To further develop useful management guidelines for such critical materials and minerals, a number of factors need to be carefully weighed. Low availability of resources, geologic evidence of domestic resources or lack thereof, international trade relations, existing domestic production capabilities, stockpiling plans, and the potential for conservation, recycling and substitutions are all essential elements to be evaluated in determining the critical nature of the Nation's minerals or materials needs on a minerals-by-minerals basis.

I thank you for this opportunity to appear before you and hope that this has been helpful.

[The prepared statement of Ms. Babcock follows:]

TESTIMONY OF HOPE M. BABCOCK
DEPUTY COUNSEL AND DIRECTOR FOR PUBLIC LANDS & PUBLIC WATERS
NATIONAL AUDUBON SOCIETY
ON
H.R. 4281, CRITICAL MATERIALS ACT OF 1981
BEFORE THE HOUSE OF REPRESENTATIVES SUBCOMMITTEE ON SCIENCE, RESEARCH AND TECHNOLOGY AND THE SUBCOMMITTEE ON TRANSPORTATION, AVIATION AND MATERIALS

APRIL 20, 1982

Mr. Chairman and Members of this Committee:

I appreciate this opportunity to discuss with you, today, National Audubon Society's concerns about public lands protection and mineral development activities, recent legislative proposals that affect that issue, including your bill, Mr. Chairman (H.R. 4281), and the Administration's recently announced (April 5, 1982) National Materials and Minerals Program Plan and Report to Congress.

An organization of nearly half a million members, the National Audubon Society has become increasingly involved in the issues surrounding U.S. strategic mineral supplies. Our growing concern stems from the fact that the strategic mineral supply has become a factor in the debate over protection of our public lands. As an expression of this concern, National Audubon joined with six other national conservation organizations to prepare a report on strategic minerals issues and public land policy, which was released October, 1981. In that report, we looked at the assumptions and issues involved in domestic production of and need for strategic minerals, foreign dependence and the availability of public lands to mineral development. I would like to ask that the Executive Summary of that report be placed in the record of this hearing.

After a comprehensive review of the nation's strategic minerals needs, the issue of foreign dependence and the availability of the nation's public lands to satisfy those needs, we have concluded that:

- America is not hostage to the Soviet Union or any other country with respect to its mineral needs;
- the domestic sources of most of these minerals are on private not public lands;
- less than 20 percent of the nation's public lands have been withdrawn for environmental reasons from or restricted for mineral development activities;
- pending legislation (H.R. 3364 and H.R. 5603) and the Administration policy would unnecessarily open up wilderness areas to mineral development and disrupt the process of recovering public lands for wilderness characteristics and mineral potential.

The National Audubon Society and other national conservation groups have participated in the legislative debates surrounding increased access to mineral resources on public lands and have made many of these points before. We have testified in opposition to H.R. 3364, the National Minerals Security Act, and in opposition to H.R. 5603, the Wilderness Protection Act, because of our position that there is no need at the present time to increase private, single use access to our nation's public lands. Despite what our critics say, the environmental community is not at all desirous of taking positions which might in any way jeopardize our national security. However, it is our assessment of the factors in the strategic minerals debate that acceleration of mineral development on public lands, opening public lands which are currently withdrawn to mineral activities, or weakening the regulations which provide protection for surface resource values on these lands are unnecessary actions and are, in fact, not in the national interest.

Foreign Dependence

Critical premises behind this Administration's strategic minerals program and also behind H.R. 3364 and H.R. 5603 are the presumptions that (1) the United States is becoming increasingly dependent on foreign sources for strategic and critical minerals, and (2) that that dependence equates with national vulnerability.

It is our position that current American dependence on foreign sources of strategic minerals and materials is consistent with historic trade patterns for these materials and that for the most part, the United States has stable trading partners, like Canada, Australia, Mexico and Brazil, from which it can and does import large quantities of minerals and metals. For those industrial minerals -- manganese, cobalt, chromium and platinum-group metals -- for which we rely predominately on South Africa and Zaire -- sources not considered clearly stable -- experts in the field, such as Leonard Fischman, consulting economist and recently of Resources for the Future, maintain that producing countries, such as these, cannot afford to withhold raw materials from Western markets.

There is no clear evidence that the Soviet Union has instigated a "resource war" against the United States, such as the Administration has suggested. Two foreign policy experts, Dr. Robert Legvold of Columbia University and Dr. Robert Price of the University of California, in testimony before the Africa Subcommittee of the House Foreign Affairs Committee, July, 1981, provided ample refutation of this argument. This does not mean, of course, that our mineral needs and dependence, should not be considered as an element in our relations with the Soviet Union; however, our basic approach should be based on economic reality not inflammatory rhetoric.

Complete self-sufficiency is not necessarily a desirable or practical goal for the United States and may lead to increased rather than decreased vulnerability. Foreign minerals dependence has been a phenomenon throughout most of America's industrial history. The Paley Commission (President's Materials Policy Commission), which reviewed America's mineral dependence of the 1950's, rejected in its 1951 report, the goal of self-sufficiency as too isolationist. The goal of self-sufficiency inevitably leads to depletion of America's existing mineral resources, which would in turn leave our country truly vulnerable. Devoting limited resources, such as capital to domestic production is less economically practicable than devoting them to foreign production and improved domestic processing capacity because of the limited nature of domestic supplies of some of the more critical materials. Further the withdrawal of the United States from international supply relationships could well cause economic disruption in third-world countries, which would be to our national detriment. Such disruption could lead to political instability and could force most countries which acquire important foreign capital from the sale of strategic minerals, to the United States, to seek markets elsewhere. It is in our interest that these countries look to us as a stable, reliable source of income.

It is our view, therefore, that foreign dependence, while a military concern, is paramountly an international economic trade matter, and rather than limit opportunities, it can create new trade possibilities.

The Availability of Public Lands

The assumption behind linkage of increased domestic production of strategic minerals and freer access to our public lands is that federal land withdrawals

are somehow blocking domestic mineral production. After extensive analysis of this issue, we have concluded (and documented in our October, 1981 report) that this assumption is simply not supported by the record.

Using data from 1977, the Office of Technology Assessment (OTA) has calculated that two-thirds of the U.S. minerals production comes from private, not public, lands. As we discuss the availability of U.S. mineral resources, it is important to keep this fact firmly in mind.

With regard to our public lands, of the 728 million acres of federal lands in the United States, over 400 million acres -- over half of the public lands -- are open for development under the mining laws. Much of the withdrawn acreage (the 328 million acres) is closed for other than environmental reasons; for instance, township/municipality requests, military installations, watershed and irrigation projects, powersites, administrative sites, stock driveways and experimental stations -- a fact proponents of opening up wilderness areas conveniently ignore. Only a little over one-fourth of the nation's public lands is withdrawn from mineral activity for environmental reasons. (Based on data derived from Management of Fuel and Non-Fuel Minerals and Federal Lands, OTA, 1979; draft policy options for the Cabinet Council on Natural Resources and the Environment entitled Availability of Federal Lands for Exploration and Development of Strategic Minerals, August, 1981; and Minerals and the Public Lands, released by the National Audubon Society and six other environmental organizations, in October, 1981). Ten percent of that environmentally withdrawn federal land is in the National Park System, where the advisability of withdrawal and protection of natural resources is seldom disputed. This leaves 15 percent (or 112 million acres) of our nation's public lands outside the National Parks,

which is off-limits to mineral activity for environmental reasons. There is an additional 3.5 percent (26 million acres) on which mineral prospecting and development can take place, but only in a manner "compatible with the preservation of the wilderness environment" under the Wilderness Act of 1964 (P.L. 88-577). Given the adverse environmental impacts associated with mineral development, such as air and water pollution, soil erosion and wildlife habitat destruction, these percentages hardly represent disproportionate protection of natural resource values being held in the national interest.

Pending Legislation and the President's April 5 Report to Congress

Our position on public land availability clearly places us at odds with the assumptions behind H.R. 3364 and H.R. 5603 as well as those behind the President's April 5 Minerals Report to Congress. The rhetoric surrounding these bills and in the President's Report fails to distinguish between lands withdrawn for environmental reasons and lands withdrawn for other reasons. Thus, while we might quibble that estimates of public lands unavailability by the American Mining Congress of 75 percent and by the Administration of 68 percent are too high, much more serious is their failure to distinguish between the differing reasons for land withdrawals.

Because we do not view public land availability as the villian in the problems besetting the strategic minerals industry, we strongly oppose efforts by this Administration, as reflected in H.R. 5603, to accelerate or abort the orderly process of reviewing public lands for wilderness characteristics under the Wilderness Act, RARE II (Forest Service Roadless Area Review and Evaluation)*

* In this regard, we oppose current efforts by this Administration to circumvent the intent of the RARE II process by authorizing roads in wilderness study areas which by definition had been roadless.

and the Federal Land Policy and Management Act of 1976 (FLPMA) (BLM Wilderness Review). Several points are worth noting with respect to the wilderness review process.

1. Ninety-one percent of the 338 million acres of BLM lands have already been released to mineral activity, although the FLPMA review process is not yet complete. Completing these surveys has been made a priority item for the USGS and the Bureau of Mines, and the Administration has voluntarily accelerated to 1987 the FLPMA 1991 deadline for completion of the BLM Wilderness Review.

2. Under the Wilderness Act of 1964, most national forest wilderness is examined for mineral potential prior to designation.

3. Under the Forest Service Roadless Area Review and Evaluation (RARE II) process initiated in 1977, 25 million acres of the 190 million acre national forest system has been surveyed to date.

4. Although the U.S. Geological Survey/Bureau of Mines mineral survey process which takes place under each one of these review procedures has not provided, by any means, an exhaustive and definitive assessment of the public lands, it has focused on those areas for which protective restrictions are being considered. Of the 106 areas reviewed by the Survey and BOM, strategic minerals in any amount greater than a "trace" were found in only 25 areas.

5. As wilderness areas have been established, many boundary accommodations have been made to assure mineral access by industry. For example, specific provisions were written into the last Congress' River of No Return Idaho Wilderness legislation to assure the availability of what appeared to be significant cobalt resources in the Blackbird area. The Congressional committee reports accompanying the 1980 Colorado Wilderness legislation make it clear that previous mineral development and mineral potential were both factors in delineating

the wilderness area boundaries which finally emerged. During the debate over Alaska wilderness each of the seven "world class" mineral sites identified by the mining industry was excluded from the eventual wilderness boundary. They were the Bohemia Basin site, which was excluded from the West Chichagof-Yakobi Wilderness, the Green's Creek site, which was excluded from the Admiralty Island Wilderness, and the Quartz Hill site, which is excluded from the Misty Fjords Wilderness.

6. Lands that are found not to have overriding wilderness value during the wilderness review process are "released" immediately for mineral exploration and development.

In light of these facts, we oppose H.R. 3364 because the bill will:

- allow private industry to nominate sites in wilderness areas giving private mineral interests priviledged access to public resources which have been withdrawn in the national interest;
- give the Secretary of the Interior unprecedented and broad discretion to open to mineral development any Congressionally "withdrawn, restricted or closed public lands," including national parks and national wildlife refuges;
- extend by 10 years the Wilderness Act of 1984 deadline for new mineral claimstaking and mineral leasing. Such an extension is both unnecessary and not in the public interest.

We oppose H.R. 5603 because the bill will:

- allow the President to open <u>any</u> wilderness area to drilling and mining before the year 2000 in case of some vague, undefined "urgent national need" and without Congressional concurrence;

- open all wilderness lands after the year 2000 for further mineral development;
- allow the President, at any time, to withdraw protection from BLM wilderness study areas, without the consent of Congress, by declaring them unsuitable for wilderness designation;
- permanently release all BLM study areas recommended for wilderness production that have not been designated by Congress as wilderness by January, 1985, and all non-designated Forest Service lands under the RARE II process, by 1988. This type of "now or never" schedule would allow opponents to kill wilderness proposals simply by delaying them for a few years by parliamentary tactics;
- bar the Forest Service from ever again proposing any additional wilderness areas after current proposals have been acted upon. This provision along with the permanent "release" of the BLM lands from further consideration is like passing a law against further expansion of the National Parks System.

Most of the elements of these two bills are reiterated in the President's April 5 Report to Congress. We are, however, pleased to support the President's position on the need to continue to inventory federal lands to determine their mineral potential, but we oppose any effort by the Administration to seek new legislation, like H.R. 5306, which will open up environmentally withdrawn lands for mineral development or will accelerate by too much the wilderness review process.

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We do not believe that either the economy or the international situation let alone the small amount of acreage we are talking about, justifies any single purpose focus on the nation's public lands to correct a perceived imbalance in our strategic minerals position or throwing aside the protections crafted by Congress of these critically important natural resources.

We are also concerned about rhetoric in the April 5 Report about "eliminating barriers to the development of the mineral resources of the deep seabed" and want to be sure that those "barriers" are not those protecting this fragile environment or the safety of those who will be performing this work. Similarly, mindful of the Administration's record to date on "reform" of environmental regulations, we await with some anxiety the details behind any plan to reform "excessively burdensome or unnecessary regulations and statutes" which adversely affect the domestic minerals industry. While individual cases may exist in which the public interest would be served by these kinds of changes, any sort of blanket approach, such as that proposed by the Administration or set forth in H.R. 3364 or H.R. 5306 or the April 5 Report should be viewed with suspicion by this Congress.

Not wishing to come before you today with nothing good to say about any of the legislative proposals pending before this Congress or about the President's April 5 Report, we praise the support found in the President's Report for more research and for promoting efforts to improve foreign minerals data and analyses, and for identifying the need to improve our stockpiling position. However, we would have liked to have seen greater attention paid to the need for a careful assessment of our domestic capacity to process minerals as well as a more realistic analysis of our international trading relations. Making changes in

domestic policies and practices without adequate information in this regard is likely to preclude development of a cohesive strategy for better addressing mineral problems.

We are disappointed that the April 5 Report does not contain an explicit statement supporting expanded research on alternate methods of conserving, substituting and processing critical materials, including new manufacturing technologies, improved mining and recovery techniques and less mineral consumptive product designs. We would ask this Congress to be sure that there be as full public disclosure of the results of this research as possible, within the confines of our national security interest, and that the minerals industry not be allowed to withhold data from the public or the government for proprietary reasons.

We were disappointed not to see in the April 5 Report support for modernization of the 1872 Mining Law to insure the application of environmental standards to the minerals industry and to provide for an equitable leasing system and for a fair economic return to the government and the American people. We would also have liked to have seen a strong policy statement by the President making public lands withdrawn for environmental reasons the last of the lands made available for mineral exploration and development and a suggestion that the land management agencies both develop appropriate criteria implementing that policy and incorporate those criteria into the planning process mandated by the Resources Planning Act and FLPMA.

Finally, let me comment on H.R. 4281, the "Critical Materials Act of 1981," which proposes the establishment of a Council on Critical Materials. The clear intent of this proposed legislation is to implement the National Materials and Minerals Policy, Research and Development Act of 1980. We commend the Chairman for recommending the establishment of a Council on Critical Materials in the Executive Office of the President. In that regard, we oppose the suggestion in the April 5 Report by the Adminsitration that the Cabinet Council on Natural Resources and Environment fulfill this function.

We agree with the premise underlying both proposals that there is a need to coordinate and pull together the diverse programs in the Executive Branch dealing with minerals and materials and the need to avoid unnecessary expense and overlap in these programs. We favor H.R. 4281 over the President's proposal because of the independence of the Council from existing departments, which will increase the Council's ability to advise the President and to compel coordination in these dispered programs. However, we are concerned lest the Council be staffed and funded in such a way to create a bias towards the interest of the minerals industry. To counter that possibility we suggest that one of the three members be representative of the public interest in protection of natural resources and the environment or that alternatively, the staff of the Council be organized in such a way that that mandate can be carried out. We also request that the deliberations of the Council be open to the public and to the degree that the Council's recommendations have enabling authority that the formulation of those recommendations be subject to public notice and comment.

We would also recommend that language be added to the findings and purposes section of the bill (Section (2)(a)) to assure consideration of environmental protection in the process of developing adequate supplies of strategic critical industrial materials and consistency with the goals and purposes of the Wilderness Act. In that regard, we would like to see some recognition in H.R. 4281 of the importance of natural resources and the need to protect those resources for future generations while achieving our desired national goal with respect to supplies of strategic minerals and materials. We would also like to see some mention in Section 5 of the need to undertake research in furtherance of alternate methods of conserving, substituting and processing critical materials.

I thank you for this opportunity to appear before you and hope that this testimony has been helpful.

RESUME
OF
HOPE M. BABCOCK

Personal Data and Education

Born February 13, 1941, New York, N.Y.
Graduated from the Brearley School, 1959; Smith College, B.A. (Magna cum laude), 1963 (political science); Yale Law School, LL.B., 1966 (administrative law, land planning)

Bar Admission: New York and District of Columbia

Experience

1981 - present: Deputy Counsel and Director, Public Lands and Public Waters Program - National Audubon Society

Responsibilities include litigation, legislative and administrative lobbying, and membership work on a wide range of issues, including on-shore and off-shore oil and gas development, coal and hardrock mining, leasing and claims, land exchanges and management, coastal development, refuges, wilderness areas and parks. Also, responsible for providing tax, corporate and other general law advice, as required, to organization and its chapters.

1979 - 1980: Partner, Blum & Nash

Energy and environmental practice, including representation of various energy companies and public interest organizations, before federal executive agencies and legislative committees. Familiarity with requirements for tax-exempt organizations and private foundations, Federal Election law, and immigration law. General litigation, corporate, tax, trusts and estates.

December 1977 - 1979: Deputy Assistant Secretary - Energy and Minerals (Regulation), Department of the Interior

Responsibilities included developing policy initiatives and implementing regulatory programs and legislative strategies for the Department's coal, oil and gas (both on and offshore), uranium and geothermal programs. Oversight responsibility over the development and implementation of regulatory programs under the Surface Mining Control and Reclamation Act of 1977 and the Outer Continental Shelf Lands Act of 1978, as amended. Initiated studies of Department's goethermal and uranium regulatory programs with a view toward improving their effectiveness and responsiveness. Participated in the establishment of Departmental positions on programs and policies of a regulatory nature initiated by other Federal agencies or by legislative action. Served as principal advisor to the Assistant Secretary - Energy and Minerals on energy and mineral regulatory matters and as a contact point within the Department for the staffs of the Domestic Policy Council, Council of Economic Advisors, and Council on Wage and Price Stability

April 1977 - December 1977: Associate with Lowenstein, Newman, Reis and Axelrad

Represented utility, vendor, and trade association clients before Nuclear Regulatory Commission, Environmental Protection Agency, Department of Energy, and the U.S. Army Corps of Engineers.

1971 - 1977: Associate with the Washington, D.C. Office of LeBoeuf, Lam, Leiby and MacRae

Represented utilities, architect-engineers, and vendors before same agencies listed above. Also appeared before the Federal Power Commission (now the Federal Energy Regulatory Commission), and the Federal Energy Administration. Wrote appellate briefs, drafted comments on and proposed changes to various Federal regulations, and other forms of representation on energy and environmental matters. Research on various international problems relating to the production, utilization, export and ultimate disposition of nuclear materials. Represented commercial nuclear waste burial company.

1969 - 1970: Part-time Associate with Shaw, Pittman, Potts, Trowbridge and Madden (now Shaw, Pittman, Potts, and Trowbridge)

Assisted in Federal Court litigation arising from aviation insurance claims. Detailed analysis of U.S. and foreign aviation laws and treaties.

1966 - 1968: Assistant Regional Counsel to the Northeast Regional Office of the Office of Economic Opportunity

Prepared and reviewed Government contracts, including program grants and incorporation documents.

Miscellaneous:

Member of the Boards of Directors of the Environmental Policy Center and the Environmental Policy Institute; appearances in D.C. Superior Court on behalf of indigent juvenile defendants

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Mr. GLICKMAN. Thank you for your excellent testimony.

Mr. Margolin, I would like to ask you what the present state is of our industrial processing capabilities? You mentioned that in your statement, as did Ms. Babcock. Are they sufficient to meet our economic and strategic needs, and is the problem of critical materials as much one of industrial processing as it is of minerals supply?

Mr. MARGOLIN. I think our basic industries are in a deplorable state. If the trend line continues, we are in real trouble in this country. I personally have done a study of the steel industry in this country and made projections that we would be losing because of normal attrition, lack of capital formation, over 11 million tons of shipment capabilities over the next decade. I think that particular timeframe may be shortened as more and more announcements are made in the next weeks and months about plant closures.

The same thing applies to the nonferrous industry and our ferroalloy industry, as many people have testified before me at this meeting and others, as far as the state of the present basic industry in this country.

Mr. GLICKMAN. Then not only will we have perhaps problems with raw materials, but we face even graver national security implications because we are not going to be able to make the product here in America.

Mr. MARGOLIN. That is correct. We are exporting our industries overseas.

Mr. GLICKMAN. This is perhaps not totally within the jurisdiction of the subject matter, but you talked about the different role between Government and industry in some of our competitive areas, it was one of the items in the testimony.

Mr. MARGOLIN. Yes.

Mr. GLICKMAN. I recently spent 2 days at Boeing in their Seattle Division. We were talking about the competition that they have with 767 and Airbus and the promotion effort the European economic committee has in connection with the marketing of that airplane.

How do you propose improving that industry/Government cooperation to improve our international competitiveness?

Mr. MARGOLIN. One of the arenas that seems to disturb the industrial base in this country is the fact that there is a lack of clear signals from the Government. Therefore, in many of the operations, people are not making decisions until they see a clearer picture of what the Government wants. It may be in the regulatory arena. It could be in the tax arena or whatever.

The operation such as in Japan with MITI taking the lead on this industrial base, or with the Germans and the French and the British—I just came back from a meeting in Berlin in which we talked about the steel crisis of the world. This was one of the issues that came up out of that meeting, that the national Governments are taking a stronger position, either directly or by setting policy which allows the private sector to operate in a better business atmosphere.

Mr. GLICKMAN. This administration would argue that they are doing the latter. That is, they have lowered tax rates dramatically and they have provided the incentives for capital formation. They have argued that they are doing the same thing in the regulatory

picture. Yet, I have kind of this instinctive underlying feeling that that is not going to hack it in terms of competing with particular Japan and our Western European allies. That is, there may need to be something more direct than that.

Mr. MARGOLIN. I would tend to agree. What the direct approach would be is something that would have to be looked at carefully.

Mr. GLICKMAN. Do you have any comments on the Cabinet Council vis-a-vis the H.R. 4281 is a better way of implementing a national policy?

Mr. MARGOLIN. Well, we, as professionals, don't think we have the capability of talking about organizational structures. But we would like to make one comment, and that is that a lot of it is attitudinal. If you want to say there is a materials problem and a minerals problem in this country, then let us go about trying to solve the problem, let us not talk all around it and study and restudy it. Let us get to working on the actual problem and the solution of the problem. But whatever organization is more favored, they should be doing that.

Mr. GLICKMAN. Mr. Shamansky?

Mr. SHAMANSKY. Thank you, Mr. Chairman.

Mr. Margolin, on page 2 of your testimony, you say in the "Scope of the Problem," paragraph 2: "Our ferrochrome industry is declining. We are exporting copper ore for foreign processing." That really sets up all kinds of ideas into my head. When I was in college way back then, we had a definition in economic geography that, "A colonial economy was one in which they exported raw materials and imported finished goods." We have made it to that status now, apparently, correct?

Mr. MARGOLIN. Correct.

Mr. SHAMANSKY. OK.

Now, if I understand this correctly, we export the ore and import the finished copper.

Mr. MARGOLIN. This is an example of the material coming out of the West, going to Japan for smelting, and coming back.

Mr. SHAMANSKY. OK. I don't mind telling you that that is really goofy. I am from Ohio and we have iron ore. When I was in college we could make steel for the market better than anyone else because we had the iron ore at the Great Lakes, we had the coal nearby, we had cheap water transportation, and we had the end use all right there. It is very logical and it worked.

I am reacting then negatively to your suggestion that there is something about the Government's role in this that keeps everybody off guard because they don't quite know where the Government is going. I would like to make a suggestion that the industry—and I mean both management and labor—has to look at their own industries. There is nothing about the Government's policy that so set up an industry that it is cheaper to take the ore out of this country, send it to Japan, and import the copper back if the parties themselves don't want it to be that way. I think that is a shift that it is too easy to use the Federal Government as a whipping boy.

Mr. MARGOLIN. Mr. Shamansky, I would agree with you that industry, management and labor have made contributions to this problem. I think, though, if we had some policies directed at the

broad aspect, which we have been pushing for years to have, then we may be able to get some of the light at the end of the tunnel, everybody could see what the real problems are, and we could go about solving them.

Mr. SHAMANSKY. I don't want to act as if the elements, the ridiculous aspect of this thing is, it seems to me, fairly obvious. At what point does management become galvanized and says, "What's going on here with our own industries?" The executives of the copper companies can't turn to labor and say, "What is this difference? Why can we not compete?"

U.S. Steel managed to find $6 billion or so to make a capital acquisition of Marathon Oil from Finley, Ohio. They managed to find capital to do that. They could not find the capital to renew their plants around Youngstown, Ohio. So the capital is there, given the will to do something about it.

It is interesting that you are saying—and looking at this very distinguished list of members—that you apparently give up on the idea that leadership can really come from the effected industries themselves. I am sort of disappointed that everyone is looking to the Federal Government to provide the leadership, and then, in the other breath, they sit around complaining because Government is interferring with their businesses.

Mr. MARGOLIN. Well, I am not in any way implying that we are giving up. I don't think we are.

Mr. SHAMANSKY. Well, where is the leadership, though? You are not giving up, but are you very effective about it? Do you have a program? Does your federation have a program?

Mr. MARGOLIN. I don't think it is in the province of our federation as a bunch of professionals to come up with a program as such. I think we are a communicator, we are trying to bring together the various forces that act in the materials community and get the message across.

Mr. SHAMANSKY. To whom are you communicating? Who is talking to whom?

Mr. MARGOLIN. That is what we are trying to improve. We want to get academia to be talking to industry, industry to be talking to Government, Government to be talking to academia. Part of our overall program is trying to implement that arena. The Harpers Ferry conference is a mechanism we are using to get the problems aired out by all people and try to come up with direction.

Mr. SHAMANSKY. I will leave this line of questioning with just this comment: The idea that it is cheaper for the steel to be imported from Japan than it is to produce it in the Great Lakes-Ohio Valley is simply a self-inflicted wound.

Mr. MARGOLIN. I will fully agree with you that we in this country, in our own markets, we can produce steel cheaper than anybody else, especially in the Great Lakes area. I have studied that for the last 15 years, and I have studied foreign operations, and I do believe that.

Mr. SHAMANSKY. I am a layman and I figured that out. So there is hope for us all here.

I would like to allude very briefly to your paragraph 11 on page 5. "There is concern that the Nation may not be producing adequate supply of technologists, vocationally trained personnel and

support people to operate the equipment and facilities required by industry."

I don't mind telling you, sir, that we have had a battle in this committee to make sure that that condition not prevail. Unfortunately, it is become a very partisan sort of thing. The Democrats, the majority here, at least, trying to overcome the absolute mindless approach of the Office of Management and Budget in doing away with the training of our future cadres of researchers and professors and weeding in that area. I think it is absurd.

With respect to energy on paragraph 13 on page 5, "Problems related to the role of the materials life cycle in the field of energy need to be redefined in light of changes in technology and the economy"—again, we recently had the Secretary of Energy. I guess he will soon be a dean or a president of a medical college. He is an oral surgeon by profession. His testimony over the last year and a quarter would convey, at least to me, the impression that the only energy policy that this administration has is with nuclear, somehow or other, buying Clinch River and all those other things, to almost the exclusion of any other process available.

Would you like to elaborate on your paragraph 13?

Mr. MARGOLIN. Yes. One of the things we have been noting of late in the press was the number of failures we are having in our nuclear reactors that are in operation. They happen to be materials failures. So are finding out new things that we didn't know when we first designed our nuclear reactors.

Mr. SHAMANSKY. About the brittleness of metal?

Mr. MARGOLIN. That is right.

Now, as you go into the synthetic fuels program, we may be finding some new arenas that we have to operate in and we may need to have newer materials in order to deal with some of those problems that we haven't thought of today.

I remember going back when we were looking at steam boilers, back in the 1950's, and we had corrosion problems until we recognized the fact that in some of our imported oils we have vanadium and sulfur, a perfect combination for making sulfuric acid, and they were corroding our boiler tubes. We came out with new designs and new material substitutions for that.

So it will be a continuing program as we go into the 1980's in our changing energy posture.

Mr. SHAMANSKY. I would like to congratulate both you and Ms. Babcock on your statements. They were very succinct and quite to the point.

Thank you, Mr. Chairman.

Mr. GLICKMAN. Ms. Babcock, you made the point that nations such as Zaire and South Africa cannot afford to withhold raw materials from Western markets. But the closing of the Zairian cobalt mine in 1978 was due to invasion of Zaire. How do we deal with similar inadvertent upheavals that may have absolutely nothing to do with what the current government wants to do? I am trying to play the devil's advocate with you.

Ms. BABCOCK. That is fine. I think one of the things that we do is to focus our research efforts to avoid the dependence on that single material, and cobalt is probably a poor example of that. We may be a bit up the creek in a situation like that. I don't think, however,

the answer is to open up the wilderness areas to mine for cobalt, cobalt which may be of questionable quality and the material which the market cannot absorb.

Mr. GLICKMAN. The other question I would ask is what is your reaction to a critical or strategic materials impact statement, as suggested by the administration?

Ms. BABCOCK. An impact statement such as an environmental impact statement or the regulatory statement?

Mr. GLICKMAN. I think it would be an across-the-board impact statement as part of his program plan.

Ms. BABCOCK. I think that is probably a very good idea, particularly if they are going to be recommending—certainly the regulatory changes will require some type of impact statement to comply with NEPA. In terms of an impact statement accompanying this report, it would be very, very helpful to have them assess the environmental implications of what they are proposing, if that is responsive to your question.

Mr. GLICKMAN. It would not be an environmental impact, it would be a response of critical materials impact. It would be a parallel to NEPA essentially that would also--whatever regulatory action were taken, there would have to be critical materials impact statement.

Ms. BABCOCK. An evaluation of what the impact would be on our strategic minerals and materials?

Mr. GLICKMAN. Yes.

Ms. BABCOCK. Well, I guess, on the one hand, I would say that that might overemphasize a situation. And I would also, I guess, add that the delay factor that that would add to implementing any policy that another agency has to go through to evaluate something. I don't see why that type of assessment wouldn't be made part of whatever the proposal is or a part of a NEPA statement to be rolled in, not as a separate action.

Mr. GLICKMAN. OK.

Ms. BABCOCK. I am not quite sure what they are proposing there.

Mr. GLICKMAN. I am not either. But I would think that they are proposing something to parallel NEPA.

Ms. BABCOCK. But geared specifically toward the impact on our strategic minerals supply.

Mr. GLICKMAN. I happen to think that that is probably not an unreasonable situation, but I don't know how it would be implemented.

Ms. BABCOCK. Again, I think it would be a question of public participation and whether or not that document itself is open to legal challenge. You can really spinoff and do a variety of concerns from a proposal like that.

Mr. GLICKMAN. Do you have any different definition of "critical minerals or materials" than what you have heard here today?

Ms. BABCOCK. I have heard a range of definitions. No, I think our concern is that the definition not be so broad that whatever programs are developed to accelerate or give preference to the use of those materials or the extraction of those minerals not cover on the entire waterfront. For example, we wouldn't want to see coal listed as a strategic or critical mineral if that meant somehow the coal leasing process was jeopardized, accelerated, that the strip mine

regulations would come out even weaker than they are right now. We would look at it in terms of the consequences. So we would prefer a fairly narrow definition.

Mr. GLICKMAN. OK.

Mr. Shamansky, do you have any other questions?

Mr. SHAMANSKY. No, Mr. Chairman.

Mr. GLICKMAN. I think this has been a very good hearing this morning. We will have the next set of hearings Thursday morning at 9 o'clock. We appreciate your testimony from the Federation, as well as Ms. Babcock.

The hearing will stand adjourned until Thursday at 9 a.m. o'clock.

[Whereupon, at 11:12 a.m., the subcommittees adjourned, to reconvene at 9 a.m., Thursday, April 22, 1982.]

OVERSIGHT

Public Law 96-479—National Materials and Minerals Policy, R. & D. Act of 1980 and Consideration of H.R. 4281—Critical Materials Act of 1981

THURSDAY, APRIL 22, 1982

HOUSE OF REPRESENTATIVES, COMMITTEE ON SCIENCE AND TECHNOLOGY, SUBCOMMITTEE ON TRANSPORTATION, AVIATION AND MATERIALS, SUBCOMMITTEE ON SCIENCE, RESEARCH AND TECHNOLOGY,

Washington, D.C.

The subcommittee met, pursuant to notice, at 9:05 a.m., in room 2318, Rayburn House Office Building, Hon. Doug Walgren (chairman of the Subcommittee on Science, Research and Technology) presiding.

Present: Representatives Walgren, Shamansky, Dunn, and Skeen.

Staff present: Paul C. Maxwell, majority science consultant; and Donald L. Rheem, minority technical consultant.

[The prepared opening statement of Mr. Walgren follows:]

OPENING STATEMENT
HON. DOUG WALGREN
H.R. 4281 - "CRITICAL MATERIALS ACT OF 1981"
APRIL 22, 1982

TODAY IS THE SECOND IN TWO DAYS OF HEARINGS ON THE CRITICAL MATERIALS ACT OF 1981 (H.R. 4281). ON TUESDAY, WE HEARD FROM A NUMBER OF ADMINISTRATION WITNESSES ON THE PROPOSED LEGISLATION AS WELL AS THE PRESIDENT'S RECENT PROGRAM PLAN AND REPORT RELEASED EARLIER THIS MONTH. I THINK IT WAS CLEAR AT THAT TIME OF OUR SUBCOMMITTEE'S CONCERNS FOR THE OVER-EMPHASIS IN THE PROGRAM PLAN FOR MINERALS AND DOMESTIC PUBLIC LANDS MANAGEMENT. I BELIEVE WE MUST BE AWARE OF THE CONTINUING MATERIALS PROBLEMS IN SUCH BASIC PRODUCT-ORIENTED INDUSTRIES SUCH AS STEEL OR THE AUTOMOTIVE INDUSTRIES, AS WELL AS OUR FUTURE MATERIALS' NEEDS.

TODAY WE WILL HEAR FROM TWO GROUPS OF OUTSIDE WITNESSES TO LOOK AT CURRENT PROBLEMS -- SPECIFICALLY IN THE STEEL INDUSTRY AND THE AEROSPACE INDUSTRY, AS WELL AS A VIEW TO THE FUTURE REGARDING ADVANCED CERAMICS AND COMPOSITES. AS A CONGRESSMAN FROM PENNSYLVANIA, I AM WELL AWARE OF THE CONCERN FOR THE STEEL INDUSTRY AND I AM PARTICULARLY INTERESTED IN HEARING TESTIMONY ON THIS ISSUE. IN ALL, I THINK THIS MORNING'S TESTIMONY SHOULD BE VERY HELPFUL TO THE SUBCOMMITTEES' CONTINUING ACTIVITIES REGARDING H.R. 4281.

Mr. WALGREN. I want to welcome you to the committee. Today is the second of 2 days of hearings by the two subcommittees, the Subcommittee on Science, Research and Technology and the Subcommittee on Transportation, Aviation and Materials of the Committee on Science and Technology on the Critical Materials Act of 1981 (H.R. 4281). On Tuesday, we heard from a number of administration witnesses on the proposed legislation as well as the President's recent program plan and report released earlier this month covering critical materials problems.

I think it was clear at that time of our subcommittee's concerns for the overemphasis in the program plan for minerals and domestic public lands management. I believe we must be aware of the continuing materials problems in such basic product-oriented industries such as steel or automotive industries, as well as our future materials needs.

Today we will hear from two groups of outside witnesses to look at current problems, specifically, in the steel industry and in the aerospace industry, as well as a view to the future regarding advanced ceramics and composites.

As a Representative from Pennsylvania, I am well aware of the concern for the steel industry and I am particularly interested in hearing testimony on this issue. I think this morning's testimony should be very helpful to subcommittees' continuing activities regarding H.R. 4281. We hope to create a record which will support progress in this area that we can work with in recommending specific actions to other members and in attracting the attention of the full committee as a whole to this problem.

Our first panel is made up at this point of Richard Mulready, the vice president of technology of Pratt & Whitney Group of United Technologies; and E. F. Andrews, the vice president of Allegheny International, who comes from my part of the country. We are particularly pleased that you are here, Mr. Andrews. Of course, Mr. Mulready, the same applies. However, it is always nice to see people whom I have met before who are good friends.

Let me invite you to proceed. We will start with Mr. Mulready. Written statements or details will be made part of the record automatically, but please feel free to proceed as you think most effective in creating a record here. We are very interested in your views in this area.

Mr. Mulready.

STATEMENT OF RICHARD C. MULREADY, VICE PRESIDENT, TECHNOLOGY, PRATT & WHITNEY GROUP, UNITED TECHNOLOGIES

Mr. MULREADY. Thank you very much, Mr. Chairman. Mr. Chairman and members of the committee, I am Dick Mulready, vice president, technology, for Pratt & Whitney Group, the largest unit of United Technologies.

I am pleased to be here today to comment on the administration's response to Public Law 96-479, the National Materials and Minerals Policy Research and Development Act of 1980, as well as the Critical Materials Act of 1981 (H.R. 4281) sponsored by Chair-

man Fuqua and numerous other members of the House Science and Technology Committee.

Pratt & Whitney manufactures jet engines for both military and commercial applications. As a user of large quantities of strategic and critical materials, we are concerned about Government policies and legislative initiatives which affect raw materials availability, research and development efforts, stockpile policy, and other related matters.

In October 1979, I testified before a joint hearing of the Science, Research and Technology Subcommittee and the Natural Resources and Environment Subcommittee. The subject then was the Materials Policy Research and Development Act of 1979 (H.R. 2743) which later became Public Law 96-479. It is gratifying to see that the House Science and Technology Committee has continued its interest in and concern with strategic and critical materials matters.

Before addressing the subjects of today's hearing, I would like to review some of the events which have taken place since I testified on the Materials Policy Research and Development Act. In 1979 Pratt Whitney became directly involved in the issue of strategic materials when it appeared that both cobalt and titanium would be in short supply. The potential shortages of our basic raw materials led us to take several steps to reduce our needs. First, we utilized materials better by developing and applying "near-net" shape manufacturing techniques. Forgings—and these are forgings made with a special process—were designed and made with less overstock, thereby reducing the amount of material that is machined away as scrap. We also recycled more of the chips that were machined away and returned this scrap to engine-quality use. Prior to that time, that scrap had been downgraded and used for secondary uses. These forms of conservation meant less raw material needed for a finished part.

Lastly, we substituted alternative materials, ones with lower strategic material content, wherever possible. These efforts resulted in substantial savings in the materials of concern, and in the case of cobalt lowered our needs by approximately 20 percent.

In the past, Pratt & Whitney and United Technologies have participated in various congressional initiatives which have related to the availability of strategic and critical materials. We have presented our views during congressional hearings on such subjects as publiclands policy, domestic production of cobalt, the condition of the Defense Industrial Base, and reform of the National Defense Stockpile.

The U.S. Government has also begun to address the materials-availability issue, and it has taken the following constructive actions in the last 2 years. The Idaho Wilderness legislation was enacted in July 1980 with a precedent-setting provision which puts aside a small portion of the River of No Return Wilderness where cobalt mining is designated as the dominant use for the area. Last summer, the administration purchased 5.1 million pounds of cobalt for the stockpile. This cobalt meets the highest technical standards of the industry today and provides a small but known reserve suitable for jet-engine use.

In addition, the U.S. Government has announced an agreement with Jamaica to obtain 1.6 million tons of bauxite. This transaction

is particularly noteworthy since agricultural barter—dairy products—and excess stockpile material—tin—will be utilized for the acquisition.

The release earlier this month by President Reagan of the national materials and minerals program plan and report to Congress represents a very significant milestone in our Nation's approach to the materia's issue. We applaud the administration's effort to address this subject in a comprehensive and coordinated fashion. The policy statement and report represent a significant step in identifying the country's materials problems and the actions necessary to reduce our vulnerability to supply cutoffs. While we have not had adequate time to study the administration's proposal in great detail, we endorse the administration's choice of the following cornerstones of our national materials policy:

A national defense stockpile which contains materials in sufficient quantities and of the appropriate grade, form, and quality to reduce our vulnerability to foreign supply cutoffs of materials which we normally import and need to support our economy and national security;

Identification of domestic resources and the continued search for technology which would eventually allow these resources to be produced in an economical and an environmentally acceptable manner;

Support for R. & D. which can produce substitution options and conservation and recycling methodology in the future;

And, last, increased focus on national materials and resources issues through Government awareness and action.

One of the concerns addressed by both H.R. 4281 and the President's materials policy statement is the coordination of materials research and development efforts. Pratt & Whitney's experience with the coordination of Federal research and development efforts has historically been good. It has been very good, I might add. We are currently working with the Defense Advanced Research Projects Agency (DARPA) and the Air Force Materials Laboratory (AFML) on rapid solidification technology which offers a promising development approach to new materials which require lower strategic material content.

Another example of the results which can be obtained by Government-industry cooperation can be found in NASA's effort which has traditionally provided a stimulus to the aeronautical industry by supporting proof-of-concept work. This conceptual technology has opened doors for industry to channel its development resources. Past testimony before congressional committees has provided evidence of NASA contributions to technology in aeronautics which benefited both commercial and military aviation. One proof-of-concept effort supported by NASA Lewis Research Center led to the technology developed by our industry in the 1950's enabling compressors to accept a higher axial air flow velocity. That work on the transonic flow compressor became the basis of today's high-efficiency compressor designs. It made possible the modern, efficient, high-bypass ratio turbofan leading to U.S. supremacy in the engine field.

A strong U.S. aerospace industry provides a number of benefits to our national economy. According to Aerospace Industries Associ-

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ation statistics, the U.S. aerospace industry supplied close to 1.2 million jobs in 1980 and contributed almost $12 billion in net exports to our 1980 trade balance. Continued Goverment-industry cooperation is essential to assure that these benefits are maintained.

Public Law 86-479 states in the declaration of policy:

> The Congress further declares that implementation of this policy requires that the President shall, through the executive office of the President, coordinate the responsible departments and agencies to, among other measures, * * * establish a mechanism for the coordination and evaluation of Federal materials programs, including those involving research and development so as to complement related efforts by the private sector as well as other domestic and international agencies and organizations * * *.

The administration's national materials and minerals program plan and report to Congress indicates that this function will be carried out by the Committee on Materials [COMAT]. Established in the early 1970's, COMAT was subsequently disbanded in the late 1970's. This administration has reaffirmed COMAT's role in materials and minerals research and development efforts and has placed it under the direction of the Federal Coordinating Council on Science, Engineering, and Technology in the Office of Science and Technology Policy. Unfortunately, COMAT is not a permanent body, and there has not been high-level agency participation in its activities in the past.

Pratt & Whitney believes that Public Law 96-479's mandate concerning Federal materials R. & D. coordination would be more effectively implemented by a high-level permanent authority. We therefore believe that H.R. 4281's approach—the creation of a Council on Materials—would be preferred over COMAT which historically has not enjoyed high-level attention and has no permanent charter.

I would like to restrict my remaining comments to the national defense stockpile and the administration's proposed stockpile policy. The substantial concern shown by this administration for the condition, role, and operation of the stockpile is welcome. The administration's materials and minerals program Plan states:

> We must assure the responsiveness and staying power of the industrial base. A crucial aspect of any industrial mobilization capability is a secure, reliable, and sufficent supply of critical raw and processed materials.

This statement indicates an awareness of the vital role that materials availability and the stockpile should play in that preparedness. Review of the quality as well as the quantity of the stockpile is long overdue.

The establishment of a panel with private-sector input to review the quality of stockpile material—and our company has offered to provide experts in material quality for this effort—as proposed by the administration is essential. We need to know not only the quantity of the materials held by the stockpile but also their grade, form, and technical specifications. Once the current stockpile inventory is known, action to improve quality and adjust quantities can be more sensibly undertaken.

Two other administration initiatives regarding the stockpile merit discussion. Pratt & Whitney supports the administration's decision to extend the planning period for stockpile acquisitions and disposals from the current annual plan to a 5-year assessment

of potential acquisitions and disposals. This longer term perspective is vital if we are to adequately assess materials trends and developments and effectively use this data to make well-informed decisions regarding material purchases and sales.

The Reagan administation has also indicated its intention to establish a study group chaired by the General Services Administration to "determine whether there are inventory management deficiencies that can be corrected by measure such as rotation of stocks and upgrading of storage sites." We believe that this review should be conducted by some other body, perhaps the General Accounting Office, rather than an in-house effort by GSA which currently manages the day-to-day stockpile activities.

In general, Pratt & Whitney believes that the administration's stockpile policy is a good one, but unfortunately it does not go far enough. The crux of our stockpile problem is its organizational structure or in this case the lack thereof. Stockpile responsibilities currently are spread throughout the executive branch of the Government. A picture of today's stockpile organization chart closely resembles a jigsaw puzzle. GSA handles the daily stockpile operations while the Federal Emergency Management Agency is responsible for stockpile policy. A number of other Government agencies also have a piece of the stockpile puzzle including the Departments of Defense, State, Commerce, and Interior.

Pratt & Whitney has recommended in past testimony before the House Armed Services Committee that structural changes in the stockpile's organization are essential if true improvement in our stockpile situation is to be achieved. Senator Harrison Schmitt has introduced the Strategic Stockpile Reform Act of 1981—S.1982—which establishes an independent Strategic Stockpile Commission to handle all stockpile responsibilities including management, policy, and day-to-day activities. We believe the Schmitt approach is constructive with several important benefits. First, it consolidates all stockpile functions establishing a central authority for this important institution. Second, it creates an independent body, isolated from political pressures, to address what have historically been controversial and sensitive issues.

The quality, grade, form, and quantity of stockpile inventories, while important facets of the stockpile question, are overshadowed in the long run by the importance of an effective stockpile organizational structure. Pratt & Whitney endorses the concept of an independent central authority to carry out the important functions of the stockpile and respectfully suggests that this approach be given serious consideration by the administration and the Congress.

Pratt & Whitney looks forward to working with you, Mr. Chairman, and members of the House Science and Technology Committee in addressing these and other issues of mutual concern.

I would be happy to answer any questions you or members of the committee may have.

[The prepared statement of Mr. Mulready follows:]

HOUSE SCIENCE AND TECHNOLOGY COMMITTEE

JOINT HEARING OF THE

SCIENCE, RESEARCH AND TECHNOLOGY SUBCOMMITTEE

AND

TRANSPORTATION, AVIATION AND MATERIALS SUBCOMMITTEE

APRIL 22, 1982

Mr. Chairman and members of the Committee, I am Dick Mulready, Vice President, Technology, for Pratt & Whitney Group, the largest unit of United Technologies. I am pleased to be here today to comment on the Administration's response to Public Law 96-479, the National Materials and Minerals Policy Research & Development Act of 1980, as well as the Critical Materials Act of 1981 (HR-4281) sponsored by Chairman Fuqua and numerous other members of the House Science and Technology Committee. Pratt & Whitney manufactures jet engines for both military and commercial applications. As a user of large quantities of strategic and critical materials, we are concerned about government policies and legislative initiatives which affect raw materials availability, research and development efforts, stockpile policy and other related matters.

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- Support for R&D which can produce substitution options and conservation and recycling methodology in the future.

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One of the concerns addressed by both HR-4281 and the President's Materials Policy Statement is the coordination of materials research and development efforts. Pratt & Whitney's experience with the coordination of federal research and development efforts has historically been good. We are currently working with the Defense Advanced Research Projects Agency (DARPA) and the Air Force Materials Laboratory (AFML) on rapid solidification technology, which offers a promising development approach to new materials which require lower strategic material content.

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effectively implemented by a high-level, permanent authority. We therefore believe that HR-4281's approach - creation of a Council on Materials - would be preferred over COMAT which historically has not enjoyed high-level attention and has no permanent charter.

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In general, Pratt & Whitney believes that the Administration's stockpile policy is a good one, but unfortunately it doesn't go far enough. The crux of our stockpile problem is its organizational structure - or in this case, the lack thereof. Stockpile responsibilities currently are spread throughout the executive branch of the government. A picture of today's stockpile organization chart closely resembles a jigsaw puzzle. GSA handles the daily stockpile operations while the Federal Emergency Management Agency (FEMA) is reponsible for stockpile policy. A number of other government agencies also have a piece of the stockpile puzzle including the Departments of Defense, State, Commerce and Interior.

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The quality, grade, form and quantity of stockpile inventories, while important facets of the stockpile question, are overshadowed in the long run by the importance of an effective stockpile organizational structure. Pratt & Whitney endorses the concept of an independent central authority to carry out the important functions of the stockpile and respectfully suggests that this approach be given serious consideration by the Administration and the Congress.

Pratt & Whitney looks forward to working with you, Mr. Chairman, and members of the House Science and Technology Committee in addressing these and other issues of mutual concern. I would be happy to answer any questions you or members of the Committee may have.

RICHARD C. MULREADY
VICE PRESIDENT-TECHNOLOGY

Richard C. Mulready is Vice President-Technology at United Technologies' Pratt & Whitney Group, East Hartford, Connecticut.

He joined the Corporation as an analytical engineer at United Aircraft Research Laboratories in 1946, after receiving a Bachelor's degree in Aeronautical Engineering from Massachusetts Institute of Technology.

In 1952, Mr. Mulready moved to Pratt & Whitney as an assistant project engineer, where he was involved in the development of ramjets and other advanced aircraft engines. Later, he was junior project engineer assigned to the conversion of the company's J57 turbojet to liquid hydrogen fuel, then project engineer on the model "304" hydrogen expander engine.

In 1958, Mr. Mulready became project engineer for the first liquid hydrogen/oxygen rocket engine, the RL10, which later became one of the workhorse engines in the U.S. space program.

He also has served as assistant chief engineer at Pratt & Whitney's Florida Research and Development Center, where he was responsible for the development of the highpressure hydrogen/oxygen rocket engine technology. In 1970, he was named program manager of new business development, and in 1976 he became Director, Technical Planning. In 1980, he was appointed to his current position.

Mr. Mulready was one of three recipients of the coveted 1974 Goddard Award presented by the American Institute of Aeronautics and Astronautics, presented for "significant contributions to the development of practical LOX-hydrogen rocket engines."

Mr. WALGREN. Thank you very much, Mr. Mulready. Let us then turn to the other witnesses for their statements, and then we will come back for some discussion.

Mr. Andrews, it makes sense to go in order of appearance at this point.

STATEMENT OF E. F. ANDREWS, VICE PRESIDENT, ALLEGHENY INTERNATIONAL

Mr. ANDREWS. Right. Thank you very much, Mr. Chairman. For the record, I am E. F. Andrews, vice president for materials of Allegheny International. I appreciate this opportunity, Mr. Chairman, of appearing today on an issue that has been close to my heart for many years. I have spent the last 35 years of my life dealing with the raw material problem, and I have spent the last 15 years of my life trying to get a Government national materials policy of some sort established.

I do have a written statement which is quite complete and can go into the record. I will move on for just a few remarks and then go to questions.

For the first 150 years of this country's history, we were considered to be self-sufficient in our materials needs. We did not need anybody. Isolationism was a political issue. All of a sudden after World War II, we began to address ourselves to the critical material problem. The Paley Commission was appointed, and America slowly began to realize that perhaps indeed we did have a problem. Two things basically happened. Two basic things happened that changed after World War II. One was the technological explosion, the explosion that catapulted us into the jet age and the computer age.

You do not remember airplanes, Mr. Chairman, with propellers. I started the war in an airplane with a propeller on it. We went to the jet age. We put a man on the Moon. We got the Shuttle. We built a computer. We did this all since World War II. That technological explosion then said that you no longer can get along with iron, cotton, wood, and tobacco. We needed the more noble and more sophisticated metals of chrome and cobalt and platinum and so forth.

The second thing that occurred during this same period of time was a process that I like to call decolonization. At the same time that we had this technological explosion demanding more sophisticated metals of which America was virtually devoid, we had the process of decolonization. Whereas originally, when we needed cobalt, we went to Belgium and they went to their Belgium Congo to get some cobalt; today you go to Kinshasa or Lubumbashi and get it from a country called Zaire or Zambia.

The explosion of the Third World placed the world's reserves in the hands of less politically stable, shall we say, and perhaps even unfriendly countries.

Up front, I think we should also make clear, Mr. Chairman, that there are no shortages. There are no shortages of anything. This world, I do not believe, is running out of anything, nor will it, and I do not even care because if we will get out of the way and let the system work as we dig deeper and deeper into the bowels of the

Earth to get less and less yielding ores, the cost to do so will rise, and we will begin to design away because we cannot afford it. By the time we do truly run out, it will not make any difference. Nobody will be using it anyway. The system is self-correcting. There is no shortage and do not worry about it. There is no crisis today, so let us not act in the atmosphere of crisis. There is no crisis. I do not know of any metal today that is not in plentiful supply and dropping price. Therefore, be at ease.

However, I did not say that we did not have a problem. Indeed, I believe that we do. Now, there are those who would say, as we have for the last 30 years every time we have gone lurching from crisis to crisis and we pull out into one of these dead periods, "Well, the problem is over. Let's not do anything."

Well, we are in one of those lulls. There is no shortage, nor do I think there ever will be, and we are fortunately not in a crisis. I do not say that I do not think that we will ever have a crisis. I think that we may.

The problem then is abrupt interruption, unexpected denial of access, not existence of material. Will we always have access to the material we need when we need it? That is the only problem.

Therefore, as those who would say that this is not important, let us examine the importance for a little bit because we tend to get locked into the defense orientation or the national security orientation of the problem. I totally agree with that. That has to be up front. The Constitution says that the Federal Government exists for the purpose of the national security. Any time you put anything ahead of that you are asking for trouble in my opinion.

However, is it important? Well, it is important to your district, Congressman. Without manganese of which we have none in the United States, we have got a bit of a problem. We do not know how to make steel. Without chrome we have got a bit of a problem, for by definition stainless steel must contain 11½ percent of chrome—by definition.

Now, without chrome and without cobalt and without manganese, these three products alone—and we have none in the United States virtually—some cobalt—we cannot build your jet airplane. We cannot make his jet engines. We cannot build a nuclear submarine. We cannot build a barrel for a tank. We cannot shoot off a missile. Ah, that is defense. We have got to do something.

Also, without chrome and without cobalt and without manganese, you will have to repeal your environmental laws. We cannot build a catalytic converter or an air scrubber without chrome. You will have to close all your restaurants or repeal your sanitary food laws. You will have to shut down your hospitals or go back to wooden tables and rusty knives. Without these items, you not only change the standards of living but the very health of this Nation. You change its physical health as well as its economical health because we cannot build a computer, drill for oil, build an automobile, or build a power station.

Helmut Schmidt has said of the economy of Germany with only 60 million people, "Shut me off from African chrome for a period of 2 years and you will decrease my employment by 2 million people in a population of 60 million and cause my GNP to drop by 25 percent." Now, take that in terms of the United States.

Now, is there a problem? Well, the real right says that there is a resource war going on. I happen to be generally in support of that view. Seven years ago, I was asked point blank whether I thought that the Russians had a design to encircle the critical materials of the world, my answer to that was, "Yes, a grand plan."

Certainly, you look at the Mideast and their encroachment upon the Persian Gulf; certainly, you look at southern Africa and the encroachment and destabilization that is going on there, today, a war exploding again in Namibia; the Persian Gulf. Of metals. Certainly, look at the tinderbox of Central America, Guatemala, El Salvador, Nicaragua, the oil, the nickel, the bauxite, the Panama Canal, the sealanes. The growing influence of these three critical areas in the world is obvious. That is the resource war. Let southern Africa fall into the hands of the Russians or whoever our enemies might be and they will control 99 percent of the world's platinum, 98 percent of the world's manganese, 97 percent of the world's vanadium, 96 percent of the world's chrome, 87 percent of the world's diamonds, and 70 percent of the world's gold, and I could go on with the list.

We do not believe there is a resource war? A Russian under every rock? Let's not believe that. All right. There is a growing group of people in this country and in the United Nations who would have us self-deny our access to chrome and manganese. Let us put an economic sanction on South Africa and close it down. Are we prepared to do that?

You say that they are not going to do that. What about a cartel? The Arabs have proven that 11 nations can cartel successfully for a few years, but only 2 nations need to cartel to settle on chrome and cobalt if they choose to, and they could. That could happen, I suppose.

However, even forget that. What if southern Africa goes up in sheer racial war and destabilization? It took 7 years to bring a tiny country like Rhodesia down. What will it take to bring a country like South Africa? What if that stuff just was not coming out for 7 years? Our national security isn't endangered. Nobody is shooting at us. You just cannot get at it. That could happen. What if the white people down there just say, "OK, hang it. Let's walk out." That is a country holding every deepmining record in the world. When Mobutu took over Zaire he had 14 college graduates in the entire country, and he went into a 20-year retrogression. Mozambique is a good example of the rapid exodus of the skills and technology of a country. That could happen.

However, let's say that none of those things are going to happen. I am just using scare tactics. Just continue what you are doing today. Ninety-six of the world's reserves of chrome are furnishing 40 percent of the world's supply of chrome annually. Four percent of the world's known reserves of chrome are furnishing 60 percent of the world's annual supply of chrome. Ninety-five percent of the Western World's known reserves of manganese are furnishing 37 percent of the annual consumption. Five percent of the world's reserves are furnishing 63 percent of the world's consumption. Continue those practices.

The Bureau of Mines has said in a report to the State Department that every known deposit outside of South Africa could exhaust within a decade. Therefore, you do not have to have, "The

Russians are coming. The Russians are coming." Just keep what you are going to do.

Now, are we going to have a technological breakthrough? Yes. Of course, we are going to have it. Look what frozen food did for tin and the need for it. Look what satellite communications did for the need of copper wire. Certainly, we are going to mine the sea someday. It will not be in my lifetime probably. Maybe it will be in yours, Mr. Chairman. We will probably mine the moon. Certainly, we will have technological breakthrough. You are going to see some fascinating things in ceramics and plastics. We are going to have great breakthroughs. There will be carbon composites, carbon matrix, all technologies of the future. However, I have two problems. One is time. You cannot tell them to hurry up and be inventive. Can we and are we ready in the next decade? I will worry about that down the road and let technology take care of that. Second, the University of California has said that it would take $2 billion and 10 years of research to design away from 60 percent of our consumption of chrome, just 60 percent. Now, who is going to spend $2 billion and 10 years to learn how to get along without a product that the South Africans have a thousand years supply of and will probably be selling at 50 cents a pound—probably? Who wants to invest in that kind of research just to put it on the shelf just in case?

Now, with that situation I don't think that Government policy has been very helpful. In fact, it has more or less exascerbated the problem. Take the situation of chrome. Within one decade—and this is when I started calling for a national materials policy and a body mandated by law to manage this problem—the United States passed a whole passel of laws that mandated an increase of 20 to 25 percent in our consumption of chrome. These were your environmental laws. We mandated an increase in the consumption of chrome. Within the same decade we placed an economic sanction on the country that at that time was furnishing 95 percent of our chrome. We were cutting ourselves off from what we had just mandated an increase in consumption of. At the same time, we established an enforcement agency in the EPA which ran around and shut down one-third of the smelters that were processing what chrome we did have. At the same time, another agency of Government removed the restriction on the export of stainless scrap out of this country, and we sent out thousands of tons every ton of which contained 400 pounds of chrome. At the same time, we enacted land management policies that began to strangle the exploration in this country for chrome. Now, that all happened in one decade as Government policy.

We just went through a 3-year shortage of molybdenum tripling the price to this country, but we produce twice as much molybdenum as we consume, but we just had a severe shortage and tripled our price. Why, because we are the only industrial nation in the world—and I am not saying that this isn't right—I am pointing it out—that permits the export of a critical material prior to satisfaction of domestic need. Should we continue that? We are for free trade. That is Government policy.

At the same time—and one of the reasons that I began to call for closer management of the stockpile—for 10 straight years, when

you could see the cobalt supply shrinking because of a dropping nickel and copper market and moving more and more to a thin cobalt market, the U.S. Government stockpile policy put 5 to 6 million pounds per year into the market—and there was an 18 million pound market—for 10 straight years masking the growing shortage, and the invasion of Shabas Province was merely the straw that broke the camel's back. We ourselves increased our vulnerability by our action in Government policy. This is why I have been saying that indeed we need a national materials policy. We need a national materials policy that has a mechanism or an organization mandated by law to manage this problem. Nobody is in charge. That is the basic problem.

We need to internationalize our data base. One of the problems with the Bureau of Mines—the finest data base, the finest organization in any government anywhere in the world, unparalleled, has no peer—it is interior, and a great big section of the problem is exterior. We must internationalize our data base. We must take a National inventory of the assets of our land. The people of America have a right to know what is in the closet before you lock the door and then knowingly make the decision whether to lock the door. We still may lock it, but at least we will know what is inside of it when we lock it.

We must take a look at our export and import laws and come to the conclusion of when we have damaged an industry. When we put the sanctions on Rhodesia, I testified before this Congress that leave them on for 3 years, and you would set in force the irreversible demise of the ferrochrome industry and we did it. Now, we are running around and saying, "My, my, we have got a sick ferrochrome industry." We did it as policy.

We need to examine the incentives and remove the disincentives on research, conservation, recycling, all of these things that you do, not because of the critical material, but because it is good business. It is just plain good business.

We need to examine a whole passel of laws: The antitrust laws, international laws, tax laws, laws affecting multinational corporations that are obstacles to working in a worldwide arena.

We need to reexamine the priorities we put on ourselves between national security, human rights, and environment. I have come out many times opposed to the use of economic sanctions on critical materials as an instrument for bringing political change, because it has a 100-percent failure record.

We need to speak to the stockpile which I will not take time to go into. My paper gives a lengthy presentation of my position on the stockpile, but I will add two points. One is we should look at private stockpiling with Government incentives. I personally do not think that it will work, but two countries are doing it. Studies now are underway by the International Economic Study Institute in Washington to look at this. We must get over being afraid to at least take a look at economic use of the stockpile because every transaction in and out of that stockpile for 20 years was for economic abuse. Congress better set the parameters for economic use. You cannot tell me that if our security is not threatened but we are closing this country down because of a 7-year destabilization in southern Africa that you are not going to turn to your stockpile.

Now, you are going to do that under what rules, under what regulations, under whose authority? We better quit being afraid to look at that problem.

Now, as to the President's report, I would say several things. Basically, it is good. I am optimistic. It is too narrow. It doesn't go far enough. It does establish the fact that now the Government officially recognizes that we have got a problem. It does, indeed, establish that fact. It is not specific, and it is virtually devoid of any funding considerations. I do not see where anything is going anywhere unless somebody funds something to do something. It does call for an action of domestic policy and reexamining the land acts and so forth, but it virtually ignores the international problem. It does establish a cabinet council to carry out its problem. and under this administration I am perfectly happy with that cabinet council because that cabinet council, in my judgment, is moving well, doing a good job, has the initiative, is moving along. My problem is that the next administration will eliminate it. I, therefore, call for something mandated by law that could keep it in.

I have spoken to the stockpile management. I think this report ignores economic stockpile considerations, while the National Materials Policy Act of 1980 under section 5(c)(3)2 calls for attention to that problem. You cannot ignore it. The law has mandated that we look into it. It skirts the Defense Production Act. I think that we should not only extend the Defense Production Act, but we should extend title III of the Defense Production Act and have it as a weapon in our arsenal. We do not have to use it until we need it, but we should have it available.

I have already said what I would do with our data base. Unfortunately, the President's report to the Congress calls for no legislation. Therefore, we must continue to give consideration to the bills before this Congress: Fuqua H.R. 4281, Santini H.R. 3364, Schmitt S. 1922, McClure S. 1338 all—and I could go on with others—have portions of them with merit worthy of our consideration.

I am optimistic. I think we have taken another step toward a national materials goal so long as we consider the President's report as a beginning, and that is all that it is.

Thank you very much, Mr. Chairman. I would be glad to answer any questions.

[The prepared statement of Mr. Andrews follows:]

STATEMENT OF
MR. E. F. ANDREWS

VICE PRESIDENT
MATERIALS AND SERVICES

ALLEGHENY INTERNATIONAL, INC.

BEFORE THE

COMMITTEE ON
SCIENCE AND TECHNOLOGY

SUBCOMMITTEE ON TRANSPORTATION, AVIATION
AND MATERIALS

SUBCOMMITTEE ON SCIENCE RESEARCH AND
TECHNOLOGY

U.S. HOUSE OF REPRESENTATIVES

April 22, 1982
WASHINGTON, D. C.

I am E. F. Andrews, Vice President, Materials and Services, for Allegheny International. I appreciate this opportunity to speak to the issues before this committee. I have spent the last 35 years of my life dealing with the problems of raw materials supply and have been calling in a very specific way for a national materials policy for the past 15 years. I am very pleased to see that one may be appearing on the horizon.

I would like to make a brief statement summing up where we have been and where we are. I am attaching for the record a white paper that I developed about a year ago which sets forth in a very specific way recommendations concerning a national materials policy.

It is now a well accepted fact that, while this country for many years considered itself self-sufficient in its material needs, the technological explosion following World War II created a need for more sophisticated metals to support us in the jet and computer age. During the same time period, the process of decolonization was also occurring, placing huge deposits of these sophisticated metals in the hands of Third World or eastern block oriented nations, thus creating the concerning dilemma of increasing import dependence on a politically unstable portion of the world.

Let me state up front, today there are no shortages. There is no crisis. In fact, I do not believe that this world is running out of anything. The problem is merely access at time of need. Some say there is a resource war, and it is the current plan and strategy of the Soviet Union to encircle and control these Third World resources so that they might have the power to deny us access when it suits their purpose. One needs only to examine the encroachment of the Soviet influence in the Persian Gulf, southern Africa, and Central America to be concerned that perhaps a resource war does indeed exist. However, if we are not ready to accept that thesis, we still have a problem. There are those who would place extended economic sanctions against South Africa, which has the largest reserves of chrome ore and manganese, thus denying ourselves access. There is the possibility of cartels, civil war, and extended destabilization of southern Africa, cutting us off from vital resources. There is the possibility of a rapid exodus of the white skills and technology with a retrogression of production as occurred in Mozambique and other places. Any of these would cause us severe supply problems.

But, let us say none of these things happen. If we continue present rates of operation, 96% of the world reserves of chromium furnishes only 40% of the annual production. The 4% outside southern Africa furnish 60%. For the western world supply of manganese, 95% in southern Africa furnishes 37% of annual supply. The 5% outside furnishes 63% of annual supply. If this rate of depletion continues for another decade, exhaustion of all reserves but African becomes a real threat.

How important is cobalt, chrome, and manganese? From a defense point of view, without them we do not know how to make steel, jet engines, gun barrels, missiles. But also, without them, we would have to repeal our environmental laws, close down our food processing plants, close our hospitals, shut down power stations, stop drilling for oil.

Of course, research and technological breakthroughs will supply some of the answers. Look what frozen food did to the need for tin and satellite communications to the need for copper wire. Someday, we will mine the ocean or even the moon. Time is the problem. What is our plan for abrupt interruption? Can we wait on research then?

Government policy not only has not helped, but in many cases, totally exacerbated the problem. Chrome, cobalt, and molybdenum are examples of such government policy abuse.

For all of the above reasons, I have been advocating for a long time that we do need a national materials policy covering both the domestic supply that we do have and the international supply that we do not have. The policy calls for:

1. A mechanism or organization to establish and implement.
2. Internationalization of data base.
3. National inventory of the assets in the land we do have.
4. Reexamination of our export and import policies.
5. Establishment of incentives and removal of disincentives for research and conservation.
6. Reexamination of our laws--anti-trust, international, etc., and removal of the obstacles to solving the problems.
7. Reexamination of our priorities among national security, human rights, environment, etc.
8. Total reexamination of the stockpile--its policies. Study of the need for private stockpiling and the need to establish parameters for the economic use of the stockpile.

With regard to the President's report, on balance, it is good. I am optimistic that it will lead to something more substantive. It is a beginning, but only a beginning.

It does establish the point that we are at risk with overseas dependency and need a policy.

It is not specific and is virtually devoid of funding considerations.

It does call for an active domestic policy and examination of our various land acts. It almost ignores the international problems that face us.

It does establish a Cabinet Council to carry out this program.

My concern is that, without the mandate of law, will the next administration eliminate such a council?

It does establish some improvements in stockpile management--the 5-year consideration.

It does not get to the guts of the problem and is mostly cosmetic.

It skirts past the issue of economic stockpiling and private stockpiling. While the National Materials Policy Act of 1980 calls for protecting the national security, economic well being, and industrial production, it seems to me that we must consider economic use and stop economic abuse of the stockpile.

It postpones consideration of Title 3 and the Defense Production Act. I recommend that we extend Title III and keep it as a weapon in our arsenal, available for use if and when it is truly needed.

It does call for improvement in our data base. But training a few people in the State Department is hardly internationalization of the Bureau of Mines. Making metal experts out of diplomats seems to me to be a tough job.

There is no legislation proposed in the report; therefore, I would think that we must continue to consider provisions in bills in Congress, such as Fuqua HR 4281, Santini HR 3364, Schmitt S 1982, McClure S 1338 and others. They have important provisions that need to be addressed. As I said at the beginning, I am optimistic. I assume more is to come and look forward to it.

Thank you.

A NATIONAL MATERIALS POLICY FOR A DESTABILIZED WORLD

I have devoted most of the last 30 years working in and being concerned about the materials supply problems of my company and my country. For many years, I have been calling for a national materials policy and a higher profile on this general subject. I believe it is finally beginning to move to the top of the national agenda, and I am very pleased to have it do so. In the past decade, we have gone through the National Materials Policy Commission, National Commission on Supplies and Shortages, and the interagency study of the materials problem. But nothing much occurred to change the collision course of which the Paley Report gave timely warning. Nothing much, that is, until what can be milestone legislation cleared Congress last October.

Chromium presents a good example of why such a policy is needed. The United States has virtually no chromium indigenous to this country. But at the same time, we were in an accelerating, high level of consumption, we passed a group of environmental laws that virtually mandated an additional increase in the consumption of chrome to make the clean air and clean stream equipment and converters on our automobiles. After we had mandated this increase in the consumption of chrome, we then unilaterally, in another part of government, placed an embargo on the importation of chromium from what was then our largest supplier, Rhodesia. At the same time, we applied stricter environmental enforcement on the antiquated ferrochrome industry, reducing its productive capabilities. Also at the same time, we allowed unlimited export of stainless steel scrap, each ton of which contained 400 pounds of chrome. Truly, a good example of the need for a coordinated materials policy.

A brief look at history, and particularly at some events and developments that occurred in the lifetimes of most of us here, will help explain and in part define our present national predicament in this matter.

America had all the resources it needed from the outset of its nationhood and through its first 150 years or so. It was singularly blessed with timber, water, iron, coal, copper, petroleum, and much more---adequate for the American economy of those days.

That happy condition began to change markedly after the First World War. It was not that we exhausted our resources but that new materials were required by our industrial society: rubber, for instance, as we realized with a shock when, in the Second World War, the Japanese overran southeast Asia.

The explosion in technological development during and after that last global war has meant unprecedented advances in the quality of our national life and has wondrously transformed older industries and brought new industries unimagined only decades ago. But that explosion also put an end to our historic self-sufficiency.

We are import-dependent, in whole or in part, on a long list of minerals without whose assured and long-term supply we cannot function in the industrial sense. I am not speaking here of oil, for that is a topic which has not wanted for attention, but of non-fuel minerals: chrome, cobalt, manganese, platinum-group metals, nickel, tin, tungsten, and a score or so more.

Beyond technological development at a constantly accelerating rate of sophistication, the minerals predicament was enormously complicated by vast world-wide political changes. these included "decolonization" by the old Western imperial powers and the emergence of Third World nations. And it so happened that Providence chose to endow a number of the Third-World nations, particularly those in southern Africa, with minerals on which we are most dependent.

However salutary certain global political changes may be in the historical annals of self-determination, they have meant, to say the least, a destabilization of minerals access.

Now, as we venture further into the topic of non-fuel minerals, it would be well to avoid two extremes of mental attitude.

First, there's the attitude of blind faith in technological miracles. We solved the World War II rubber crisis in short order, didn't we? We put a man on the moon, didn't we? Surely we can make cobalt or chromium out of straw or who-knows-what when the crunch comes!

The fallacy of such gee-whizery lies not in any essential deficiency of technological research and development. Lord knows we've seen astonishing developments that have altered dependence on minerals. Consider what frozen foods have meant in respect to tin cans. Or the laser and satellite communications in respect to copper wire. Yes, there will surely be technological developments at some unforeseen time that will reduce or perhaps eliminate our present dependence on one or more strategic minerals.

But the point is precisely that the time is unforeseen. Time is at the heart of the problem. What presses for immediate attention and coordinated action is getting America from now to, say, 1990 or 1995. Wonderful indeed if we are mining the moon in the next century. But what can be done to mine the earth and have assured access to its mineral treasures in the next five, ten, fifteen years?

Secondly, I recognize that there some authorities who are concerned that we may be consuming basic resources of this world at a faster rate than we should. I do not wish to get into that argument.

however, I am one who believes that the world is not really running out of raw materials. It has been said that the first pound of copper ever discovered in this world is probably still here somewhere. Of course, all and everything are finite. If somehow or other, we consume or destroy until there is no place to stand on this planet, then I guess we could say the raw materials are gone. But I do not believe that is within our time frame of thinking. I do not anticipate that we are likely to encounter any serious natural constraints on the existence of raw material, at least in the next 25 to 50 years and possibly 25 decades. In the case of those raw materials that may run out, if there are any, we will merely let the system work as we reach deeper into the bowels of the earth for less yielding ores. Costs will rise. As the cost to extract these materials rises, the price to the consumer will rise. As the price rises, consumers will be forced to design away; and by the time the supply is exhausted, the need for the product will be gone also. It really is a self-correcting system, if we will just let it alone and let it happen.

Avoiding then either extreme -- the one of blind trust in instant technology, the other of resource-despair -- let's look at the situation in four just basic minerals.

First off, there's chrome, indispensable to the manufacture of stainless steel, ball bearings, and surgical equipment. This country has virtually no indigenous chrome. The world's reserves of it lie almost entirely in southern Africa -- in the Republic of South Africa and in Zimbabwe, the former Rhodesia.

Then there's cobalt, essential to jet-aircraft engines, machine-tool bits, and permanent magnets, to name some broad categories. We import 98 percent of our cobalt, the bulk of it from Zaire, the former Belgian Congo. Guess which nations account for a big share of the world's reserves, after one totals Zaire's and Zambia's? Our not-so-well-wishers, the Soviet Union and Cuba.

Next, there's manganese, without which you can't have steel, period; and for which we are almost wholly import-dependent. Of the world's present reserves of manganese, the U. S. Bureau of Mines estimates that southern Africa accounts for some 40 percent and the Soviet Union for 50 percent.

Finally, there's the platinum group of metals, on which we are more than 85 percent import-dependent for the manufacture of catalytic converters and a variety of electronic and chemical products. Roughly three-quarters of platinum-group reserves are in South Africa and about one-quarter in the Soviet Union.

This recital indicates why the four I have chosen out of a much longer list surely quality as "strategic" and why the

reliability of their supply is less than reassuring. You also see why the Soviet Union already holds a powerful position from which to conduct a "resource war" and why southern Africa has been aptly called the "Persian Gulf of Metals."

The hallmark of such strategic minerals is their pervasive use throughout a modern industrial economy. Let us suppose, for a moment, that somebody in Detroit or any other American city were to say, well, in a pinch we could make do without chrome or cobalt.

Make do? Without these you couldn't build a jet engine or an automobile, run a train, build an oil refinery or a power plant. You couldn't process food, under present laws, or run a sanitary restaurant or a hospital operating room. You couldn't build a computer, clean up the air and water, and on and on.

The four minerals I've mentioned, plus others which we must import, impact intensely on our national defense -- for what defense could there be without planes and tanks and missiles? They impact intensely on our basic industry and on our quality of life, as shown by some of the specifics I've cited, and on the employment of our work force. With regard to jobs and national output, listen to what Helmut Schmidt, Chancellor of West Germany, has said about his country of some 60 million people. If you cut off West Germany's chrome for a year, according to Schmidt, there would be two-and-a-half million people unemployed and a drop in the GNP of 25 percent. Translate this in terms of the American economy and you have a "crises" by the most conservative definition of that term.

Such are the broad outlines of our mineral dependence. What can we do to alleviate it or at least render it less precarious?

One thing we can and must do is stop commissioning studies that come to nothing. What we need are studies upon which we are determined to act. Happily, a solid start in that constructive direction was made in the closing weeks of the last Congress. It was then that the lawmakers passed, and the outgoing President signed, what is formally known as the National Materials and Minerals Policy, Research and Development Act of 1980.

The Act declares, and I quote, "that it is the continuing policy of the United States to promote an adequate and stable supply of materials necessary to maintain national security, economic well-being and industrial production with appropriate attention to a long-term balance between resource production, energy use, a healthy environment, natural resources conservation, and social needs." It sets forth a comprehensive list of steps

to be undertaken by Executive departments and agencies in line with the Act's objectives and calls on the President to submit to Congress within a year of the law's enactment a "program plan" -- including budget proposals and organizational structures.

Against the background of this promising start, some general comments and recommendations on certain aspects of a future program may be in order.

1. We need a coordinating mechanism, operating immediately under the President. Let us call it, for the sake of hypothesis, a National Non-Fuel Minerals Board. It should have full authority to cut across departmental jurisdictions in the interest of designing and carrying out a total and consistent minerals policy.

As part of the Executive Office of the President, the N.N.M.B. would coordinate and mitigate programs, tasks and analyses among the various agencies relating to the security of strategic minerals supplies. It would also recommend action, for the President, Congress and other Executive agencies.

It would add no new bureau or department but would combine the in-place functions of one each from State, Treasury, Defense, Commerce, Interior, Transportation, Labor and Energy.

2. To facilitate private sector advice, I would establish the President's Resource Advisory Board (PRAB) -- modeled after the structure of the former "President's Foreign Intelligence Advisory Board," i.e. limited term membership of distinguished experts from relevant fields, in this case from the mining, minerals production and end user industries; plus the fields of labor, environmental studies, regulation impact, investment banking and geopolitical/national security affairs.

3. We need a thorough inventory of our nation's reserves and resources in strategic and other minerals -- a reliable data base, in other words. Specifically, this need concerns what is or may be available as reserves in America's public lands.

The Federal Government owns about one-third of the U. S. land area, mostly in the West and Alaska. In 1968, the amount of this land withdrawn from mining and exploration -- and my own concern at this point is with exploration -- came to 17 percent. Eight years later, the figure was almost 70 percent!

As an Interior Department official noted at the time, the withdrawal for conservationist purposes "is being done too

often without detailed knowledge of the existing mineral potential of these lands." At the very least, I would add, Americans have a right to know what resources of theirs have been locked away and are being locked away and why!

4. We need to internationalize the capabilities of the U. S. Bureau of Mines to assess supplies of minerals. The data base provided by the Bureau in this country -- with respect to those areas where it may freely operate -- is the best in the world. But the minerals problem is worldwide in scope, and so the data base should be as worldwide in scope as international political conditions allow.

The new public law recognizes this need by directing the Secretary of the Interior to promptly initiate actions aimed at improving the Bureau's capacity in an international sense. A decided improvement, it should be noted, could be effected by stationing a total of 20 to 30 Bureau experts in a few select countries.

5. We need a total reassessment of our present defense stockpile -- amounting, at today's inflated prices, to about $12 billion -- and we need new policies concerning it.

The reassessment should be made in the light of such considerations as quantity, quality, and mix. Are we too short on this and too long on that? What have time and weather done to the quality of, say, cobalt that was laid down 25 years ago? Should we not, for example, change the ratio of imported ferrochrome to chrome ore, now that a series of misguided actions in the past has virtually destroyed our former capacity to smelt chrome ore into ferrochrome?

Questions like these and remedial measures based on answers to them can help bring about a viable stockpile, appropriate to current realities.

A new program will then be required for, among other things, buying and selling relatively small quantities each year so as to maintain the quality of stockpile materials on the one hand and to make sure that markets are not dislocated on the other.

Further, Congress should establish parameters for certain limited economic uses of the stockpile. This statement must not be taken as implying there should be an economic stockpile, distinct from the established one for defense. Rather, it means that in the case of certain stockpile items which are essential to national well-being and on which we are import-dependent, Congress should

allow for carefully circumscribed conditions under which they can be drawn on for economic purposes.

Economic use of the stockpile could have value in providing the time required for the United States to implement such long-term and more permanent solutions as substitution, conservation, and the development of alternate sources would provide. The United States must consider this alternative in its domestic and foreign supply policy.

The present policy of using the strategic stockpile as a de facto economic stockpile, subject only to the vaguest guidance and controls, we believe, is unwise and should be discouraged.

The legislators should explore to establish guidelines under which the stockpile could be so used. Among these should be:

(a) A certain percentage of import dependency before an item would be considered for stockpiling -- example, 75%.

(b) The geographic location of the supplying countries should be considered. In other words, the urgency would be quite different perhaps on an item from Canada, as opposed to an item from China or Africa.

(c) The number of supplying countries would be heavily considered. If only two or three countries supplied the item, it would be considered with a great deal more concern than if twenty or twenty-five countries could supply the item.

(d) The ease of substitutibility of the material would be an additional criterion and the essentiality to the domestic economy and to our security would also be weighed.

(e) We should take into account the economic or non-economic leverage that we might have on the supplying country. In other words, are they more dependent upon us than we are upon them?

(f) The political stability of the supplying country would be a major consideration as would be the cartelability of the item.

Congress should also provide in the enabling legislation the parameters under which items would be taken out of the stockpile. Stockpile disposal for price stabilization purposes I consider would be unwise and an inadvisable intrusion in the free market; however, certain other parameters for disposal should be made quite clear so that all concerned would know when a disposal time was near; for example:

(a) Never dispose of stockpile for export purposes.

(b) Never dispose at a higher rate than the difference between consumption and production in this country.

(c) Never sell from the stockpile when the material is available through normal channels.

(d) Replace materials in the stockpile only at times of low market activity.

(e) Insofar as possible, sell only to domestic consumers.

The most difficult problem is providing for the management of the stockpile within the parameters set forth by Congress. How can economic use of the stockpile be designed and operated so that it will not be misused for financial advantage of special interest groups? How can it be sufficiently insulated from the political process to prevent its misuse yet insure it will achieve the public benefit for which it was established? It must be sufficiently insulated from the political process that it may act in the public interest and yet remain responsive to Congressional scrutiny.

One final word on stockpiling. It is not and cannot be a long-term solution to our import-dependence on strategic minerals. It can only serve as a buffer in case of crisis, tide us over in case of war, give us options and maneuvering room in case of civil disruption at a source of overseas supply. In short it is a limited hedge against risk in a highly disturbed world.

6. We must, as the new law states, "promote a vigorous, comprehensive, and coordinated program of materials research and development." At the same time, we must overhaul tax policies towards the mining and metallurgical industries. Ironically enough, these policies have been a disincentive, not only to research, but to the capital formation needed to develop the fruits of research as well as the resources available to us.

7. But even as we press on with R&D, we must avoid fantasies of a quick technological fix. Substitution -- the use of a new or modified substance for another -- can readily become a voodoo incantation to exorcise the demons of mineral dependence. If one remembers in this context that a substitute -- for chrome say -- has to be of as good a performance quality as the material for which it substitutes and also that it has to be reasonably price-competitive, then fantasy will give way to reality. And reality is, for example, one considered estimate that it would take us 10 years to design away from chrome and might cost as much as a billion dollars; meanwhile, there is more than a thousand-year supply of chrome in southern Africa that might well be sold for something like 50 cents a pound.

These comments should not be taken as depreciating purposeful R&D across the spectrum of materials and minerals, but rather as putting the problem of dependence in focus. The one key element of that problem is diplomatic -- which leads to the next point.

8. We must reconsider the balance -- some would call it imbalance -- we have struck in recent years between the requirements of national security and the advancement of social justice throughout the world. The Washington Star put the issue well in an editorial some months ago, entitled "Bulletin from the Resource War."

> ". . .While the Kremlin (wrote the Star) has been trying to advance its interests via build-ups of well-positioned bases and client states in such areas as Africa, the United States has concentrated on human rights and hopes of coming out 'on the right side of history' by forbearing to press material or geopolitical interests against revolutionary regimes.
>
> "There is still time for us to protect ourselves in the area of strategic materials. But it will take a rethinking of priorities in the way we define allies and adversaries abroad as well as in domestic stockpiling policies."

Keep in mind that at the heart of our predicament is fair access to sources. Put another way, the problem is not sufficiency of the strategic minerals on which we depend, but rather the peculiar nature of their geographic distribution. Given that nature, disruption of some supply is a very real possibility. And the power to disrupt is, in this matter, the power to deny.

I would briefly note, however, with respect to what the Washington Star called "rethinking of priorities in the way we define allies and adversaries abroad," the phenomenon of selective indignation. This phenomenon has characterized much of our diplomacy towards mineral-rich areas of southern Africa. For instance, at one time we embargoed the importation of chrome from the then state of Rhodesia while at the same time we were buying chrome from that citadel of human liberty, the Soviet Union.

What is the answer to such inconsistency and, more specifically, to the need for looking after our security interests no less than our moral ones? At the least, it seems to me, we should tilt to the principle that our conducting trade with another nation carries no implication whatsoever that we either approve or disapprove of that nation's internal policies.

9. Further, in the diplomatic arena, we should try, in international forums and with individual Third-World countries, to shore up contract law and equity in financial and commercial transactions. The essence of such law and equity is common benefit to all parties concerned, as we have to make clear more forcibly than we have done. To accomplish that will take, among other things, persistence and a stockpile of patience.

It has been nearly 30 years since the Paley Report warned us of the predicament that lay ahead for us in strategic minerals. The warning was by and large ignored. The predicament is upon us. But it need not become a crisis if we rally ourselves now to act steadfastly and with purpose.

The materials and minerals law adopted last fall is a good start. But it is only a start. Nothing guarantees that we will proceed with appropriate speed to make the most of it -- nothing, that is, except the initiative and resolve of people like yourselves all across the nation.

Initiative and resolve are each a human resource. And fortunately, America has those qualities in abundance.

If we bring them to bear now on our minerals predicament, we will not and cannot fail.

1/29/81

E. F. Andrews

National Bureau of Standards Workshop
February 9 & 10, 1981

97-007 O - 82 - 10

Mr. SHAMANSKY. Thank you, Mr. Andrews. I want you to understand that the chairman had to go to another hearing, and I will temporarily chair the hearing. I appreciate your coming from Pittsburgh to testify.

Dr. Hirschhorn.

STATEMENT OF DR. JOEL S. HIRSCHHORN, PROJECT DIRECTOR, OFFICE OF TECHNOLOGY ASSESSMENT, CONGRESS OF THE UNITED STATES

Dr. HIRSCHHORN. Yes; thank you. I am Joel Hirschhorn, Project Director, Office of Technology Assessment.

Mr. Chairman and Congressmen, my statement summarizes those findings of OTA's report to Congress on "Technology and Steel Industry Competitiveness" released in 1980 which are of relevance to today's hearing on the Critical Materials Act of 1981, H.R. 4281; and the administration's response to Public Law 96-479, the National Materials Policy, Research and Development Act of 1980. I will first summarize our findings on the state of the domestic steel industry, including the impact of Government policies. Then I will discuss how the existing and proposed legislation on materials policy may pertain to the specific problems of our steel industry.

My first point deals with the conditions and problems in the U.S. steel industry. Since World War II ended, the U.S. steel industry has declined from a position of world preeminence, high profitability, and international competitiveness to an industry that has fallen behind technologically, become less able to serve the needs of other domestic industries, lost its ability to compete in international markets, become one of the least profitable industries in the Nation, and reduced its workforce drastically. In the past two decades, employment in the domestic steel industry has been reduced by over 100,000 people. Moreover, the U.S. share of world steel production has dropped from about 25 percent in the early 1960's to about 15 percent today. World steel production doubled in this period; however, because steel production is very cyclic, it is today at a low-level worldwide.

There is no single cause of the decline of the domestic steel industry. Often what is spoken about as the real problem or cause is merely a consequence of something more fundamental. The industry itself has often cited forces outside of the control of management for its problems, including unfairly traded imports of steel, Government policies and regulations, and the high cost of energy and labor.

There has continued to be some steel imports which are undoubtedly traded unfairly, mostly from Europe. The majority of steel imports are, however, not in this category. During periods of low worldwide demand, considerable excess foreign steelmaking capacity could easily replace unfairly traded imports which have been prevented access to the U.S. market.

U.S. Government policies have frequently been uncoordinated, contradictory, and inattentive to critical issues facing the domestic steel industry. Unlike almost all other nations, the United States lacks a high level of awareness or of consensus on the need to have

a strong domestic steel industry. This is striking because we have more of the necessary resources than most nations and an extremely large market for steel because steel remains a critical engineering material for the functioning of our society.

The steel industry appears to have been more adversely affected by Government policies than other industries. However, it is important to note that a number of domestic steelmakers, particularly small firms known as minimills which are based on the use of ferrous scrap, have been quite successful during the period when most of the large integrated steelmakers, based on the use of iron ore in blast furnaces, have suffered considerable declines in performance. Minimills have not only been highly profitable, they have also proven themselves quite competitive against both foreign steelmakers and integrated steel firms.

While it is true that the steel industry has not received significant Federal assistance for R. & D. activities, the industry itself has spent a very low fraction of its revenues for this activity. For the most part, Government support of an industrial R. & D. has reflected the level of funding provided by industries themselves for R. & D. There has been a long trend of declining R. & D. spending. Dividends to steel company stockholders as a fraction of aftertax profits have not declined similarly even though both are discretionary uses of available funds.

Neither is the cost of environmental regulations in itself a major cause of the domestic steel industry's problems. The Japanese steel industry and some other domestic industries have had similar environmental costs. Moreover, the funds spent on diversification efforts of U.S. steel companies have exceeded the costs of environmental regulation.

Much attention has been given to the rapidly increasing costs of labor in the steel industry. However, steelworkers worldwide are generally paid premium wages because of the nature of working in steel mills. It is important to remember that the management of steel companies have acquiesced to the demands of domestic steelworkers. The lack of improvement in recent years in labor productivity, especially compared to substantial improvements by many foreign steelmakers, particularly Japan and West Germany, cannot be attributed to deficiencies of the workers themselves. Rather, the limitations of the facilities and technologies provided by the companies to its workers explain lagging productivity to a great extent.

The OTA studies have revealed the need to place increased emphasis on examining how the management of steel companies make their investment decisions regarding the creation and adoption of technological advances. Even before the industry's discretionary capital declined markedly, there was a reluctance to invest heavily in higher risk, technological innovations for production processes. The industry, for the most part, prefers to adopt proven technologies that have a record of successful commercialization. A growing dependence on foreign steelmaking technology has reduced the development of innovative technologies well suited to domestic needs and resources, such as coal based direct reduction of iron ore to replace coke ovens and blast furnaces. The industry's conservative strategy also reduces learning opportunities for steadily making improvements that can lead to gaining competitive advan-

tage. Buying proven foreign technology secures, at best, second place in the competitive marketplace. Our aging technological base, therefore, has led to lagging labor productivity, and poorer steel quality, higher energy costs, and greater pollution than our more advanced competitors.

Now, I would like to turn to the national materials policy and how that is related to the steel industry. Before one considers how a national materials policy might impact on the domestic steel industry, it is instructive to consider how past policy efforts aimed more specifically at the steel industry have succeeded. The problems of the steel industry during the past several decades have received considerable public attention. Any objective assessment of present conditions, however, would likely conclude that past Government attempts at solving the steel industry's problems have failed. The Solomon plan of the Carter Administration, including the formation of the Tripartite Committee, the EDA loan guarantee program, the Trigger Price Mechanism, and faster depreciation did not lead to any permanent or meaningful reversals of the commonly acknowledged trends in the declining performance. Neither has delayed compliance with the Clean Air Act or the general economic policies of the present administration brought about any significant revitalization of the domestic steel industry or signs that it is imminent.

As the problems of the U.S. steel industry remain, therefore, it seems appropriate to examine how the existing law, proposed legislation, and the administration's recent response on materials policy may offer some hope for public policy that might be more effective than past attempts at rejuvenating our steel industry.

Public Law 96-479 provides a definition of materials that clearly would cover steel. Steel certainly is "needed to supply the industrial, military, and essential civilian needs of the United States in the production of goods or services." Moreover, few would argue that there is not "a prospect of shortages or uncertain supply" for steel. Domestic steelmaking capacity has been declining for years, will likely decline further, and is particularly inadequate in certain product lines and for certain quality levels. When world demand for steel is at a cyclic high or when there is a major military effort underway, the U.S. dependency for even 15 to 20 percent of our steel needs could prove undesirable. Either costs increase sharply, delivery times escalate, or supplies become uncertain. Major sources of foreign steel are Japan and Europe, not North America. Moreover, it is well within the realm of possibility that continuation of declining performance in the integrated steelmaking sector could lead to steel imports accounting for 30 or 40 percent of domestic needs in the years ahead.

However, national materials policy efforts have not focused on steel or, for that matter, other basic materials processing industries that qualify for serious and comprehensive Federal policies concerned with future vulnerabilities. Within the materials policy arena, the emphasis has been on critical or strategic materials and minerals rather than high-volume traditional materials out of which the industrial infrastructure of the Nation is constructed. The focus has been on those materials for which the United States has very little if any supplies, or on those for which our foreign

sources are risky. We do not wish to suggest that this focus is wrong, but merely that the entire range of materials critical for the functioning of our society should be considered in national materials policy.

In H.R. 4281, for example, there is explicit definition of "critical materials" that would clearly direct the efforts of the proposed Council on Critical Materials to include basic materials industries such as steel. Many of the numerous Government studies on the domestic steel industry, including that of OTA, have recognized the need for some institutional mechanism to coordinate the many Federal policies that impact on the steel industry. Nor has there ever been an in-depth and continuing analytical effort within the Government to concentrate on future needs and capabilities with respect to our steel industry. There has been too much reliance on the data and analysis of the industry itself which, not unreasonably, have focused on the needs of their industry rather than on national interests which can diverge from economic considerations alone.

The current administration's approach to materials policy has generally been focused on minerals and to a lesser extent on materials. In President Reagan's statement of policy only the word minerals is used. Here too, therefore, there is little evidence for including basic materials such as steel in the programs aimed at responding to Public Law 96-479. Moreover, we understand that in response to this law the administration is conducting the second materials case study on the steel industry. However, there is little likelihood of yet another study revealing any new information. We know what the problems are. What is needed is a concerted effort for the Federal Government to motivate the industry to investment commitments in rejuvenation of its steelmaking facilities over diversification investments.

In summary, OTA suggests your subcommittees examine the potential benefits of explicitly broadening the definitions and scope of national materials policy activities to include basic materials such as steel which remain critical, essential, and of strategic importance to the Nation. More constructive policies and actions are needed that recognize the importance of the steel industry, its dynamic structure, and continuing improvements in technology such as continuous casting, and the recognition that it is the management of steel companies that must be committed to being the best technologically in order to make the industry competitive. If the proposed Council on Critical Materials in H.R. 4281 also had the clear mandate to deal with the steel industry, then the steel industry might well receive the coordinated policy attention necessary for both its own survival and the Nation's well-being.

Thank you.

[The prepared statement of Dr. Hirschhorn follows:]

STATEMENT OF JOEL S. HIRSCHHORN
PROJECT DIRECTOR, OFFICE OF TECHNOLOGY ASSESSMENT
BEFORE THE
SUBCOMMITTEE ON SCIENCE, RESEARCH AND TECHNOLOGY
SUBCOMMITTEE ON TRANSPORTATION, AVIATION AND MATERIALS
COMMITTEE ON SCIENCE AND TECHNOLOGY
UNITED STATES HOUSE OF REPRESENTATIVES

April 22, 1982

Chairmen and Congressmen, my statement summarizes those findings of OTA's report to Congress on TECHNOLOGY AND STEEL INDUSTRY COMPETITIVENESS, released in 1980, which are of relevance to today's hearing on the "Critical Materials Act of 1981" (H.R. 4281), and the Administration's response to P.L. 96-479, the "National Materials Policy, Research and Development Act of 1980. I will first summarize our findings on the state of the domestic steel industry, including the impact of government policies. Then I will discuss how the existing and proposed legislation on materials policy may pertain to the specific problems of our steel industry.

CONDITIONS AND PROBLEMS IN THE U.S. STEEL INDUSTRY

Since World War II ended, the U.S. steel industry has declined from a position of world preeminence, high profitability and international competitiveness to an industry that has fallen behind technologically, become less able to serve the needs of other domestic industries, lost its ability to compete in international markets, become one of the least profitable industries in the nation, and reduced its workforce drastically. In the past two decades, employment in the domestic steel industry has been reduced by over 100,000 people. Moreover, the U.S. share of world steel production has dropped from about 25 percent in the early 1960's to about 15 percent today. World steel production doubled in this period; however, because steel production is very

cyclic, it is today at a low level worldwide.

There is no single cause of the decline of the domestic steel industry. Often what is spoken about as the real problem or cause is merely a consequence of something more fundamental. The industry itself has often cited forces outside of the control of management for its problems, including unfairly traded imports of steel, government policies and regulations, and the high cost of energy and labor.

There has continued to be some steel imports which are undoubtedly traded unfairly, mostly from Europe. The majority of steel imports are, however, not in this category. During periods of low worldwide demand, considerable excess foreign steelmaking capacity could easily replace unfairly traded imports which have been prevented access to the U.S. market.

U.S. government policies have frequently been uncoordinated, contradictory and inattentive to critical issues facing the domestic steel industry. Unlike almost all other nations, the United States lacks a high level of awareness of or consensus on the need to have a strong domestic steel industry. This is striking, because we have more of the necessary resources than most nations, and an extremely large market for steel because steel remains a critical engineering material for the functioning of our society..

The steel industry appears to have been more adversely affected by government policies than other industries. However, it is important to note that a number of domestic steelmakers, particularly small firms known as minimills which are based on the use of ferrous scrap, have been quite successful during the period when most of the large integrated steelmakers, based on the use of iron ore in blast furnaces, have suffered considerable declines in performance. Minimills have not only been highly profitable, they have also proven themselves quite competitive against both foreign steelmakers and integrated steel firms.

While it is true that the steel industry has not received

signficant Federal assistance for R&D activities, the industry itself has spent a very low fraction of its revenues for this activity. For the most part, government support of industrial R&D has reflected the level of funding provided by industries themselves for R&D. There has been a long trend of declining R&D spending. Dividends to steel company stockholders as a fraction of aftertax profits have not declined similarly, even though both are discretionary uses of available funds.

Neither is the cost of environmental regulations in itself a major cause of the domestic steel industry's problems. The Japanese steel industry and some other domestic industries have had similar environmental costs. Moreover, the funds spent on diversification efforts of U.S. steel companies have exceeded the costs of environmental regulations.

Much attention has been given to the rapidly increasing costs of labor in the steel industry. However, steelworkers worldwide are generally paid premium wages because of the nature of working in steelmills. It is important to remember that the management of steel companies have acquiesced to the demands of domestic steelworkers. The lack of improvement in recent years in labor productivity, especially compared to substantial improvements by many foreign steelmakers, particularly Japan and West Germany, cannot be attributed to deficiencies of the workers themselves. Rather, the limitations of the facilities and technologies provided by the companies to its workers explain lagging productivity to a great extent.

The OTA studies have revealed the need to place increased emphasis on examining how the management of steel companies make their investment decisions regarding the creation and adoption of technological advances. Even before the industry's discretionary capital declined markedly, there was a reluctance to invest heavily in higher risk, technological innovations for production processes. The industry, for the most part, prefers to adopt proven technologies that have a record of successful commercialization. A growing dependence on foreign steelmaking

technology has reduced the development of innovative technologies well suited to domestic needs and resources, such as coal based direct reduction of iron ore to replace coke ovens and blast furnaces. The industry's conservative strategy also reduces learning opportunities for steadily making improvements that can lead to gaining competitive advantage. Buying proven foreign technology secures, at best, second place in the competitive marketplace.

Our aging technological base, therefore, has led to lagging labor productivity, and poorer steel quality, higher energy costs and greater pollution than our more advanced competitors.

NATIONAL MATERIALS POLICY AND THE STEEL INDUSTRY

Before one considers how a national materials policy might impact on the domestic steel industry, it is instructive to consider how past policy efforts aimed more specifically at the steel industry have succeeded. The problems of the steel industry during the past several decades have received considerable public attention. Any objective assessment of present conditions, however, would likely conclude that past government attempts at solving the steel industry's problems have failed. The Solomon plan of the Carter Administration, including the formation of the Tripartite Committee, the EDA loan guarantee program, the Trigger Price Mechanism and faster depreciation did not lead to any permanent or meaningful reversals of the commonly acknowledged trends in declining performance. Neither has delayed compliance with the Clean Air Act or the general economic policies of the present Administration brought about any significant revitalization of the domestic steel industry, or signs that it is imminent.

As the problems of the U.S. steel industry remain, therefore, it seems appropriate to examine how the existing law, proposed legislation and the Administration's recent response on materials policy may offer some hope for public policy that might

be more effective than past attempts at rejuvenating our steel industry.

P.L. 96-479 provides a definition of materials that clearly would cover steel. Steel certainly is "needed to supply the industrial, military, and essential civilian needs of the United States in the production of goods or services." Moreover, few would argue that there is not "a prospect of shortages or uncertain supply" for steel. Domestic steelmaking capacity has been declining for years, will likely decline further and is particularly inadequate in certain product lines and for certain quality levels. When world demand for steel is at a cyclic high or when there is a major military effort underway, a U.S. dependency for even 15 to 20 percent of our steel needs could prove undesirable. Either costs increase sharply, delivery times escalate or supplies become uncertain. Major sources of foreign steel are Japan and Europe, not North America. Moreover, it is well with the realm of possibility that continuation of declining performance in the integrated steelmaking sector could lead to steel imports accounting for 30 or 40 percent of domestic needs in the years ahead.

However, national materials policy efforts have not focused on steel or, for that matter, other basic materials processing industries that qualify for serious and comprehensive Federal policies concerned with future vulnerabilities. Within the materials policy arena, the emphasis has been on critical or strategic materials and minerals rather than high volume, traditional materials out of which the industrial infrastructure of the nation is constructed. The focus has been on those materials for which the United States has very little if any supplies, or on those for which our foreign sources are risky. We do not wish to suggest that this focus is wrong, but merely that the entire range of materials critical for the functioning of our society should be considered in national materials policy.

In H.R. 4281, for example, there is no explicit definition of "critical materials" that would clearly direct the efforts of

the proposed Council on Critical Materials to include basic materials industries such as steel. And many of the numerous government studies on the domestic steel industry, including that of OTA, have recognized the need for some institutional mechanism to coordinate the many Federal policies that impact on the steel industry. Nor has there ever been an in-depth and continuing analytical effort within the government to concentrate on future needs and capabilities with respect to our steel industry. There has been too much reliance on the data and analysis of the industry itself which, not unreasonably, have focused on the needs of their industry rather than on national interests which can diverge from economic considerations alone.

The current Administration's approach to materials policy has generally been focused on minerals and, to a lesser extent on materials. In President Reagan's statement of policy only the word minerals is used. Here too, therefore, there is little evidence for including basic materials such as steel in the programs aimed at responding to P.L. 96-479. Moreover, we undertand that in response to this law the Administration is conducting the second materials case study on the steel industry. However, there is little likelihood of yet another study revealing any new information. We know what the problems are. What is needed is a concerted effort for the Federal government to motivate the industry to investment commitments in rejuvenation of its steelmaking facilities over diversification investments.

In summary, OTA suggests your subcommittees to examine the potential benefits of explicitly broadening the definitions and scope of national materials policy activities to include basic materials such as steel which remain critical, essential and of strategic importance to the nation. More constructive policies and actions are needed that recognize the importance of the steel industry, its dynamic structure, and continuing improvements in technology such as continuous casting, and the recognition that it is the management of steel companies that must be committed to being the best technologically in order to make the industry competitive. If the proposed Council on Critical Materials in H.R. 4281, also had the clear mandate to deal with the steel industry, then the steel industry might well receive the coordinated policy attention necessary for both its own survival and the nation's wellbeing.

CONTINUING SUCCESS FOR UNITED STATES MINIMILLS

by Joel S. Hirschhorn
Office of Technology Assessment*
United States Congress, Wash., DC

INTRODUCTION

Most Americans have never heard of steel minimills (or market mills or nonintegrated steelmakers if you prefer). Even people who deal with industry, economics or business issues, to a large extent, are unaware of the existence of minimills in the United States steel industry. More disconcertingly, they are unaware of the historic importance of the rise of the minimills during the past decade. Today, minimills represent about 15 percent of U.S. steel production and integrated steelmakers remain the dominant segment of the industry. This may explain why many accounts or analyses of the U.S. steel industry make no mention of minimills. For example, a recent book (1) analyzes the decline of the U.S. steel industry and gives recommendations for reviving the industry, but contains no mention of minimills. President Carter's Steel Industry Tripartite Committee of industry, labor and government, had no spokesman for minimills. Most important, however, is not what minimills provide today, but what their future contribution could be.

The lack of a universally accepted or even simple definition of minimills and the absence of standardized information on minimills by government or industry contribute to the recognition problem. A useful definition is that minimills use electric furnaces and either ferrous scrap or direct reduced iron. They

* The views expressed here are strictly those of the author and not necessarily those of the Office of Technology Assessment.
(1) R. Bolling and J. Bowles, "America's Competitive Edge," McGraw-Hill, New York, 1982.

are not an operational part of an integrated steel company. A large electric furnace facility (one million tons or more per year) producing direct reduced iron from ore would not be a minimill, but rather it is an integrated steelworks, but without the blast furnaces. Minimills may range from single company, single plant operations with an annual capacity of 50,000 tons to multiplant operations of a single company with individual capacities of 600,000 tons or more and aggregate capacities of well over a million tons per year. Electric furnace shops or plants of integrated steelmakers are not described as minimills, although if they become independent, as two Armco plants did recently, then they enter the minimill segment. In addition to the blast furnace-coke oven-based integrated steelmakers, the third segment of the U.S. steel industry includes the alloy/specialty steelmakers. The key difference between these and minimills is that alloy/specialty firms make more costly steel products in relatively small quantities for more sophisticated applications as compared to commodity carbon steel products made by minimills. However, many make no such distinction between alloy/specialty steelmakers and minimills, since their size and technology are usually similar. Moreover, some minimills are becoming alloy/specialty steelmakers.

During the past decade, as discussed and documented recently by the Congressional Office of Technology Assessment (1), U.S. minimills increased their market share from just a few percent to about 15 percent today, an increase of about 10 million tons of steel production annually. There are now close to 50 minimill companies with a total of about 65 plants. This rapid growth has occurred in a period of very sluggish growth in steel demand in the United States. Minimills have captured markets from integrated steelmakers in several product lines and reduced import penetration also. Table 1 presents data for 1973, 1979 and 1980 on the three major product lines of wire rod, light bar

(1) U.S. Congressional Office of Technology Assessment, "Technology and Steel Industry Competitiveness," Wash., DC, June, 1980.

Table 1: DECREASING IMPORTS FOR THREE MINIMILL PRODUCTS
(all tons in thousands of net tons)

PRODUCT/CATEGORY	1973	1979	1980
Wire Rod:			
shipments	2,040	2,861	2,688
exports	90	27	212
imports	1,416	985	829
apparent consumption	3,366	3,819	3,305
percent imports	42.1	25.8	25.1
product/total import ratio*	3.4	1.7	1.5
Bars, light shapes:			
shipments	1,034	1,466	950
exports	12	18	25
imports	457	232	134
apparent consumption	1,479	1,680	1,059
percent imports	30.9	13.8	12.7
product/total import ratio*	2.5	0.9	0.8
Reinforcing bar:			
shipments	5,135	5,303	4,684
exports	152	86	166
imports	286	117	77
apparent consumption	5,269	5,334	4,595
percent imports	5.4	2.2	1.7
product/total import ratio*	0.4	0.1	0.1
Total steel products:			
shipments	111,430	100,262	83,853
apparent consumption	122,528	114,962	95,243
percent imports	12.4	15.2	16.3

*Product/total import ratio = ratio of percent imports of particular product to percent imports for all steel products.
Source: Based on AISI "Annual Statistical Reports."

shapes and reinforcing bar made increasingly in the U.S. by minimills. The data illustrate the impressive decline of import penetration in these three steel products as compared to all steel products, even when demand decreases.

The shift in such product lines from integrated to minimills is difficult to illustrate with data; however, from 1974 to 1980 U.S. Steel Corp. shipments in the category that includes these three products decreased 6 million tons (1). This is consistent with the closing of its wire rod mills in California in 1979 and in Chicago in 1981. In September, 1981 Jones & Loughlin Steel announced that it was closing its wire rod mill at Aliquippa, Pa. and leaving leaving the market. The American Wire Producers Association said in July, 1981 that minimills had 51 percent of the overall wire and wire-products market, with integrated mills taking 26.2 percent and imports having 22.8 percent (2).

Moreover, a number of minimills have demonstrated that steelmaking can be profitable, far more profitable than for integrated steelmakers. Table 2 presents summary data on the three main segments of the U.S. steel industry, including data which show the substantially higher profitability for minimills as compared to integrated steelmakers.

Table 3 summarizes recent modernization and expansion activities of U.S. minimills to illustrate the continuing growth trend of this industry segment. The early 1980's will likely see an increase of about 5 million tons of annual capacity.

At the same time that they have proven their competitiveness against both domestic and foreign steelmakers, minimills have moved away from the simplest steel products to more costly and sophisticated products as they continue their growth, as illustrated in Table 4. The notion that minimills merely make reinforcing bar for concrete is erroneous. Interestingly, nearly half the U.S. minimills do not make reinforcing bar.

(1) U.S. Steel Corp. annual reports of 1980 and 1978.
(2) American Metal Market, July 21, 1981.

TABLE 2: SUMMARY DATA ON THREE U.S. STEEL INDUSTRY SEGMENTS

CHARACTERISTIC	INTEGRATED	MINIMILL	ALLOY/SPECIALTY
steel shipments, % 1980 total	83	15	2
return on investment, 1978	6.9	12..3	11.1
steel only-pretax profit, 1978, $/ton shipped	9.60	31.60	81.33
employment costs, 1978, $/ton shipped	209	138	341
percent steel continuously cast, 1980	17	78	25

Sources: Mostly from "Technology and Steel Industry Competitiveness," Office of Technology Assessment, U.S. Congress, 1980. Continuous casting data, existing or committed, from, Commentary, May, 1981, Institute for Iron and Steel Studies.

The importance of the minimill phenomenon is that it signifies a fundamental restructuring of the U.S. steel industry. There continues to be a shift of market share away from integrated steelmakers to the minimills and a decentralization and reduction in the concentration of firms in the industry. While the total amount of steel imports has not been dramatically reduced by the success of the minimills, nor from other actions such as the Trigger Price Mechanism of the government, there is clearly a shift in product lines for imports

Table 3: RECENT U.S. MINIMILL MODERNIZATIONS AND EXPANSIONS

Atlantic Steel, Atlanta, Georgia: Recently completed $25 million modernization, including a continuous caster; with a third furnace capacity could increase from 500,000 to 800,000 tons annually.

Bayou Steel, La Place, Louisianna: New $160 million 650,000 tons a year mill to produce rounds, flats, angles, channels and I-beams.

Cascade Steel Rolling Mills, McMinnville, Oregon: Uprating electric furnaces from 170,000 to 250,000 tons per year and widening product range to include merchant sections.

Chaparral Steel, Midlothian, Texas: Recent $200 million expansion increased annual capacity from 600,000 to 1.6 million tons for finished steel.

Connors Steel, Birmingham, Alabama: Recent $11 million modernization.

Davis Walker, Stockton, Calif.: 600,000 tons per year mill to produce wire rod by 1983.

Florida Steel, Jackson, Tennessee: New $55.5 million minimill being built with 400,000 annual tons merchant shapes capacity; fifth plant for company.

Kentucky Electric Steel, Ashland, Kentucky: A $25 million program, including two new electric furnaces will increase capacity from 180,000 to 250,000 tons annually.

Marathon Steel, Phoenix, Arizona: Modernization increases capacity from 140,000 to 165,000 tons annually.

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Table 3 continued

North Star Steel, Monroe, Mich.: A $80 million 400,000 ton per year plant began operating in 1980; a second furnace with its existing bar mill could double capacity.

Northwestern Steel and Wire, Sterling, Ill.: Two new continuous casters at cost of $30 million and $12 million retrofit of bar mill.

Nucor Corp., Plymouth, Utah: New 400,000 ton minimill just completed; a third furnace could increase capacity by 50 percent; fourth plant for company.

Ohio River Steel, Calvert City, Kentucky: New 400,000 tons mill at $67 million cost scheduled for mid-1983 startup.

Raritan River Steel, Perth Amboy, New Jersey: New mill operational in 1979 with 750,000 tons wire rod capacity.

Roanoke Electric Steel, Roanoke, Virginia: New electric furnace and other improvements will boost capacity from 300,000 to 500,000 tons per year.

Structural Metals, Seguin, Texas: New 90 ton furnace increased annual capacity from 180,000 to 300,000 tons.capacity.

Texas Steel Co., Fort Worth, Texas: New large electric furnace, continuous caster and possibly a new rolling mill to be installed.

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as well as for the domestic integratred steelmakers. The driving force for these changes, in large measure, is the success of the minimills. Moreover, statistical information about the U.S. steel industry would be far more distressing were it not for the presence of the minimills and their better performance.

Table 4: PRODUCTS OF U.S. MINIMILL COMPANIES

PRODUCT		NUMBER OF COMPANIES
Reinforcing bar		26
Bars - round		25
	squares	13
	flats	11
Billets-carbon		22
Light sections - angles		19
	channels	12
	tees	4
Ingots		3
Wire rods - carbon		8
	high carbon	5
Wire - bright		4
	galvanized	4
	barbed	4
Slabs		3
Heavy sections - angles		3
	channels	2

Source: Based mostly on data in "Iron and Steel Works of the World, 7th edition," Metal Bulletin Books, London.

REASONS FOR THE SUCCESS OF THE MINIMILLS

While there are a number of factors that can be used in a general way to explain the success of U.S. minimills, it is possible to use three basic categories: (a) management styles and strategies, (b) economic and financial factors and (c) technology

related factors. To some extent they are interconnected. But foremost is the importance of management.

Management: The fundamental characteristics of most minimills have been shaped by the views and knowledge of management, including:

- o locating plants to take advantage of nearby ferrous scrap supplies, markets for well defined and limited steel products, available electrical energy, and available nonunionized labor;
- o establishing and maintaining excellent relations with customers, emphasizing service as well as product quality;
- o creating good relations with labor, including relatively high levels of total pay and often substantial incentives for increasing productivity; less restrictive work rules than with unionized labor are also possible;
- o developing and implementing long range strategies for expansion based on combinations of rounding out existing plants and building new plants with new product lines;
- o while not usually investing in significant R&D, nevertheless maintaining a high propensity for risk taking and quick adopton of new technology made available from any source; according to the OTA study the percentage of technically educated professonals in top management was three times greater for minimills than for integrated steelmakers;
- o maintaining the highest priority for keeping capital and production costs down in order to maintain or improve competitiveness, including, for example, design and construction of their own facilities;
- o when necessary pursuing aggressive marketing and pricing tactics in order to maintain or increase market share, even in the face of declining demand and aggressive imports.

The above list of minimill management attributes are strikingly different than the characteristics of management of large integrated steelmakers. It appears reasonable to conclude that many minimill managers, often with experience in integrated companies, believed they had to act differently in order to be

much more successful. It is also important to recognize that this success has taken place at the same time that the integrated steelmakers have suffered their most serious historic decline and during a period in which the U.S. government has assisted them in many ways through, for example, favorable trade policies, tax laws and direct assistance.

Because American industry has been so distressed in recent years, there have been many analyses of industry strategies and management. Some of these are particularly useful in understanding the strength of minimills. For example, as noted in the OTA report, the linking of manufacturing process and product life cycles together helps explain the difference between minimills and integrated steelmakers. The notions of Hayes and Wheelwright (1) include the use of a product-process matrix which explains the benefits of having a plant make relative few, high volume products in a continuous flow. In contrast to integrated steelmakers, minimills have pursued a strategy aimed at minimizing costs and maximizing the actual use of plant equipment. This is in contrast to the supermarket approach of most integrated companies who often had extremely expensive facilities being idle because too much of its broad product mix were not being manufactured most of the time. The basic idea of the minimills to build new plants in different locations in order to make different products is extremely important. This basic philosophy of carefully matching manufacturing process technology to product mix has led to extremely high efficiencies and productivities for minimills

Hall (2) has made a very interesting study of several mature U.S. industries, including steel, to examine what business strategies are particularly effective in a "hostile environment". By hostile the author means: slow growth,

(1) R. H. Hayes and S. C. Wheelwright, "Link Manufacturing Process and Product Life Cycles," Harvard Business Review, Jan.-Feb. 1979, pp. 133-140.
(2) W. K. Hall, "Survival Strategies In A Hostile Environment," Harvard Business Review, Sept.-Oct., 1980, pp. 75-85.

inflation, increasing government regulations and intensified foreign competition. Hall did not include any minimills (although he examined several large integrated steelmakers), but his general findings are enlightening. "Uniformly, the successes come to those companies that achieve either the lowest cost or most differentiated position," he concludes. While lowest cost chiefly explains the minimill success, alloy/specialty steelmakers have, to a large extent, succeeded because of product quality or property differentiation. The repeated widening of the product lines of minimill companies based on achieving the lowest cost position relative to both domestic and foreign competition, the recent trend of acquiring ferrous scrap businesses to insure future raw material supplies, and the location of plants to reduce expensive transportation costs and take advantage of demographic shifts, all provide a textbook example of management's need to have "an early warning of the coming hostility and an early strategic repositioning for a company to survive and prosper."

Finally, there is the important work of Leone and Meyer on how managment decides to add new capacity in a time when many economic laws seem to be shaken by reality (1):

> In a wide variety of industries, unit costs associated with capacity additions using the best, most up-to-date technology have followed what we call a U-shaped cost-development pattern over time. Frequently in current dollars, and to a lesser extent in deflated dollars, production costs have first declined, then bottomed out, and finally risen over time. Many industries [have] found it ever more expensive to replace or expand capacity. Productivity improvements no longer offset cost increases due to inflation, energy and capital costs, or regulatory constraints.

(1) R. A. Leone and J. R. Meyer, "Capacity Strategies for the 1980's," Harvard Business Review, Nov.-DEc., 1980, pp. 133-140.

Production costs associated with new installations tend to be higher than for existing capacity.

Today more and more industries have to seriously question any inate desire to increase capacity. The implications for management is that scale and timing, technology choices, and demand forecasting must be evaluated carefully. With regard to scale and timing, the authors note capacity additions "should be undertaken with more hesitancy, be smaller in scale, and occur more frequently. Smaller increments of capacity [are more] attractive because they risk less and are relatively easily accommodated by market growth. In practice, this phenomenon helps explain the current success of minimills in the steel industry - mills which, though not necessarily as cost-efficient as their larger counter-parts when operating at full capacity, need only minimal capital commitments. As part of a strategy to nibble away at a growing steel market, they can effectively undercut the economic arguments for constructing large greenfield mills. Larger facilities, by virtue of their dependence on volume for operating economies, lack this strategic capability." Although I don't agree with the authors' contention that at high operating rates integrated steelmakers possess an intrinsic cost advantage over minimills, their basic arguments are sound.

The second implication is for technology. "In a rising cost situation, management tends to adopt production methods with relatively high variable costs and low capital costs for the simple reason that facilities built to this rule tend to be smaller in scale and risk less capital. Management will find this risk-reducing strategy even more effective if the prices of raw materials swing with the market demand for the final product." The authors go on to note that for minimills "these small-scale facilities have a double advantage: (1) they have few economies of scale to lose in a downturn, and (2) their raw material inputs tend to fall in price as demand slackens."

Lastly, the authors note the increased importance of demand

forecasting: "Management must be able to analyze demand carefully and forecast it accurately." Simple extrapolation from the past is not sufficient anymore. It is not entirely clear whether all the minimills have grasped the point, although the shifts in products in new mills being built by experienced minimill companies suggests that they are keenly aware of the need to capture new niches in the steel market. An important related factor is that with uncertain and low demand the basis of competition for new capacity often shifts to nonprice dimensions. "The operators of minimills in the steel industry have successfully employed service and delivery times as competitive weapons."

Economic and Financial Factors: The simple fact is that the economics of minimill steelmaking are very attractive. The actual capital costs for a new minimill are about 10 to 20 percent of the costs of a greenfield integrated steelplant, about $150 to $300 per ton of annual capacity today. And roundout expansion of existing mills is even less costly and being planned by many mills, see Table 3. Moreover, all the basic inputs, such as labor, raw materials and energy, are significantly lower cost than for integrated steelmaking. Labor costs per ton of finished steel (see Table 2) are low because of high productivities, not because of low wages. Materials and energy costs are low because primary ironmaking is avoided usually, the combination of electric furnaces and continuous casting is highly efficient, and because scrap prices have been favorable. The costs of environmental regulations have been relatively low also because of the absence of ironmaking. Minimills have demonstrated that profit margins can be high for steel products generally considered to have the lowest profit margins. In contrast to integrated firms(1), minimills, for the most part, have low

(1) For example, in the recent notice of McLouth Steel's bankruptcy, after years of very poor financial performance, the firm's ownership of a private jet and membership in several posh private clubs were noted. The Wall Street Journal, December 9,

overheads, or indirect costs such as for R&D, mass media advertising, lobbying the government, and executive benefits. Generally, minimills are lean operations without a lot of fancy trimmings.

Another important economic factor is that the entry costs into the steel industry by way of minimills is relatively low and the time necessary to put up a plant rather short. It is also easier to take advantage of newly perceived opportunities.

On the financial side, minimills, for the most part, have shown a tendency to reinvest earnings in steelmaking rather than spend profits on dividends to stockholders or on diversification. It should be noted at this point that there is very limited financial informaton on U.S. minimills because many are either privately owned or are owned by relatively large corporations who do not disclose data on their minimills.

Table 5 presents data on a number of steelmakers to illustrate the diversity of profitability and, more importantly, the striking difference in dividend payment philosophies. The dividend correlator measures how closely dividend payments follow changes in net income. The data show that the more profitable companies adjust their dividends to reflect income changes. The least profitable companies maintain dividends even when income falls or actually increase dividends in some cases. Moreover, the dividend payout percentage also correlates with profitability, with the more profitable companies paying out less dividends. Even within industry segments the same dependences on profitability persist. The averages for the minimill and integrated segments reveal that minimills tend to be more profitable, pay less dividends and have their dividends more reflective of changes in income as compared to integrated steelmakers. The dividend behavior of the minimills tends to verify the aggressive, forward-looking management styles of these firms, with a philosophy of making their stocks attractive on the basis of future growth and appreciation rather than for dividend

1981.

Table 5: PROFITABILITY AND DIVIDEND DATA FOR STEEL COMPANIES 1976-1980

Minimill = M; Integrated = I;
Alloy/specialty = A

COMPANY	RETURN ON EQUITY (%)	DIVIDEND CORRELATOR	DIVIDEND PAYOUT (%)
Nucor (M)	27.5	.970	6
Carpenter Tech. (A)	17.4	.936	34
Florida Steel (M)	12.8	.854	24
Armco (I)	12.0	.929	38
Northwestern Steel & Wire (M)	11.4	.160	39
CF&I (I)	9.6	.522	75
Inland (I)	8.7	.808	54
National (I)	6.9	.497	51
Republic (I)	5.7	.831	41
United States Steel (I)	3.8	.182	78
Bethlehem (I)	3.3	-.055	97
Keystone (M)	-1.3	-	-27
McLouth (I)	-7.6	.350	-26
AVERAGE:			
MINIMILLS	12.6	.661	23*
INTEGRATEDS	5.3	.508	62*

(* = exclude negative dividend payouts)

Dividend correlator = statistical linear correlation coefficient for dependence of dividends on net income; it has a value of 1.0 for a perfect correlation for dividends increasing with increasing net income, and -1.0 for the perfect negative dependence. No value is given for Keystone because there was only one yearly dividend during period.

Based on data in company annual reports.

payments. Whereas the debt to equity ratio for integrated steelmakers has climbed in recent years, many minimills have generated sufficient profits which they have reinvested in their companies to keep their debt ratios relatively low.

Technology-related factors: A fundamental advantage of minimills is the use of highly efficient technology. U.S. minimills have demonstrated their tendency to adopt the most advanced cost-saving technology as soon as possible. Table 2 shows the much higher use of continuous casting in the minimill segment as compared to integrated firms. Many older minimills have recognized the increasing benefits of continuous casting and replaced their older equipment, something which the integrated mills are still doing at a rather slow pace. However, some of the older minimills without continuous casting have had serious problems being competitive and profitable.

Minimills have moved quickly to use very large, high powered electric furnaces and to use associated technologies, such as water cooled panels, to increase their efficiencies.

More recently, minimills are adopting direct oxygen measurement techniques to pour killed heats of low carbon steels (1), which otherwise are impractical to make.

Another area of progress has been the use of direct reduced iron as a complement to scrap which has required modifications to electric furnace practices but which provides a means for minimills to produce cleaner, higher quality steels. A number of newer minimills have been designed with the use of direct reduced iron in mind, including, for example, Raritan River Steel. And the Korf steel operations have pioneered both the production and use of direct reduced iron as the major source of iron units for a furnace.

Nucor has pioneered continuous steelmaking and have plants that roll continuously cast billets directly into finished

(1) 33 Metal Producing, "The steady ascent of the O_2 probe: mini-steel's secret weapon against low-carbon steels," Sept., 1981, pp. 62-64.

products.

All the indications are that U.S. minimills will continue to aggressively pursue and find new technological opportunities in their unrelenting pursuit of high efficiencies, high productivities and low manufacturing costs.

POTENTIAL OBSTACLES TO GROWTH

All the above factors notwithstanding, minimills live in a real world which also contains potential obstacles to their future growth.

First, there are a cluster of obstacles that have often been cited by integrated steelmakers. There might be a shortage of ferrous scrap or such an increase in scrap costs that the basic competitive position of minimills is put in jeopardy. However, there appears to be a growing consensus that scrap shortages are unlikely because, for example, increases in steel consumption are small and steel and steel-containing imports (autos) contribute to the U.S. scrap supply. And when scrap prices increase, steel prices are also likely to increase. Moreover, the greater use of direct reduced iron will provide a means of escaping the dependence on scrap. A recent report on direct reduction (1) predicts that by 1985 direct reduced iron will represent 10 percent of the input to electric furnaces. Minimills will have the option of buying imported direct reduced iron or, eventually, of making their own in relatively small plants or buying it from independent producers in the U.S. Nor is there any substantial evidence to indicate that, for most parts of the nation where minimills are concentrated, there will be any severe problems for minimills with the cost or availability of electricity. The OTA study examined the influence of future increases in energy costs. Even if electricity costs increased substantially, the cost advantage of minimills would remain; however, instead of 50 percent less energy costs traditionally, there might be a 30

(1) "Direct Reduction as an Ironmaking Alternative in the United States," Fordham Univ. for U.S. Dept. of Commerce, Nov., 1981.

percent advantage over integrated mills in the future.

Two other arguments often presented actually may have more validity. As minimills expand their product mixes, make more sophisticated products and get more technology intensive, they will indeed face higher costs. Yet it is also likely that the costs of integrated producers will rise for similar reasons. Additionally, as particularly attractive market areas become saturated, minimills will compete increasingly with each other rather than with less efficient integrated producers or foreign steelmakers. This is a real problem that can only be solved by the continuation of the trend of minimills to broaden and carefully select their products for specific new locations, and maintain their emphasis on technological superiority. The need for more sophisticated strategic planning is real.

On the less traditional side, a very real problem for minimills is the involvement of the government in ways which provide advantages to integrated steelmakers, particularly the less successful ones. A recent new benefit for the less profitable steelmaker (as well as other kinds of companies) is the ability to sell their tax credits to profitable corporations. Such government policies have as one effect sustaining the existence of fundamentally weak steelmakers. Other policies such as providing regulatory relief and import protection (from products made mostly by integrated firms) can increase capital formation that is then used for diversification rather than reinvestment in steelmaking. Minimills generally have received, proportionately, fewer benefits from virtually all government policies affecting industry. Policies which distort the marketplace have a tendency to harm the truly competitive firms.

Another factor is the lack of a minimill trade association which could serve many legitimate purposes and provide some balance to the vigorous efforts of the American Iron and Steel Institute. Although AISI has nine U.S. minimill members, their influence is very small since they represent only about 10 percent of the number of members and even less in terms of

production or sales levels. Only one out of the 68 committee chairmen is from one of these minimills; interestingly, the chairman of the electric furnace steelmaking committee is from an integrated steelmaker. At their last general meeting, when a senior industry speaker gave examples of "a great many exciting and positive stories to tell about the American steel industry today," not one was of a minimill.

What makes U.S. minimills so successful could turn out to be their weakness: their traditional free enterprise, entrepreneural and individualistic spirit. They go it alone. They want government to stay out of their way. Indeed, they are exactly the type of capitalists that made the United States great. However, the political structure of the U.S. is based, in part, on having opposing parties engage in adversarial relationships. A U.S. minimill trade association could provide balance to the information and viewpoints of the AISI representing, for the most part, integrated steelmakers. It is not necessarily a question of the minimills getting something from the government or the public, but rather providing the type of information that might prevent government policies that distort the marketplace in favor of integrated firms.

Moreover, there may indeed be increasing legitimate needs of minimills that could be better served through cooperative efforts rather than either individual pursuits, neglect or use of firms supplying the industry. For example, as minimills become more sophisticated technologically, the need for joint R&D that could benefit all the firms becomes more obvious. Additionally, need for external capital could become greater and more general public awareness of minimills might be beneficial.

Lastly, a potentially important development is the changing ownership of U.S. minimills. There has been a steady movement toward greater corporate ownership by nonsteel companies entering the steel industry through acquisition of minimills. There is also more foreign ownership of U.S. minimills. In themselves these changes do not necessarily imply anything negative. However, it seems clear that an important element of the minimill

success story is the risk-taking entrepreneural spirit normally associated with individuals and small corporate efforts. Both the increasing size of existing, successful minimills and the increasing ownership by large corporations could therefore remove some of the vitality of the minimill movement.

FORECAST OF FUTURE GROWTH

The OTA study provided a forecast of future minimill production potential by examining the possible fractions of certain steel product lines that minimills could capture by 1990. That work was based on the 1978 distribution of production of steel products and indicated that a 25 percent market share for minimills was feasible by 1990.

A revision based on 1980 data is given in Table 6. Also included in this revision are those imports which minimills have captured increasing fractions of in the past (see Table 2) and another increment of minimill production resulting from 50 percent of these imports. The result is that by 1990 U.S. minimills might represent 27 percent of total U.S. production. The assumption here is that minimills will broaden their product mix significantly into structural shapes, plates, pipe and tubing, and hot strip. It should also be noted that it is likely that there will be further plant closings by integrated steelmakers.

A recent compilation (1) indicates a raw steel capacity of 20.5 million tons annually for minimills, but does not include certain new plant additions and roundout expansions now in progress or planned. If these are taken into account, the total by 1990 would easily be between 23 and 25 million tons. Total U.S. steel production in 1990 may be less than about 100 million tons, assuming a 1 percent annual increase from 1980. Hence, it appears reasonable for minimills, with their very high yield from raw to finished steel, to reach the 25 to 27 percent market share

(1) Commentary, Institute for Iron and Steel Studies, May, 1981.

Table 6: Forecast of Potential 1990 Minimill Market Share
(all values in thousands of net tons)

Steel Product	1980 US shipments	Minimills potential	Minimills 1980	50% of 1980 imports
bars	8496	85%	7222	325
reinforc.bar	4684	100%	4684	39
wire rod	2688	100%	2688	415
wire products	1768	100%	1768	211
structurals	4861	20%	972	
plates	8080	25%	2020	
hot strip	669	25%	167	
pipe & tube	9096	25%	2274	
totals	84843*		21795	990

market share = 22785/84843 = .27

*Total U.S. shipments plus 990,000 tons gained from imports.
Source: Based on AISI Annual Statistical Report, 1980.

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level, even if it requires more expansion in the late 1980's.

The chief uncertainties in this forecast include: the general state of the U.S. economy, the import situation, government policies, and the diversification and plant closing actions of integrated steelmakers. It is important to remember, however, that not so many years the major U.S. integrated steelmakers totally dismissed the importance of the minimills. All signs are that minimills will be aided in their quest for growth by the increasing diversification efforts of integrated firms who see greater opportunities for profits from other lines of business. They may also be helped by the closing of some of the smaller integrated steelmakers that continue to face serious economic problems. Moreover, there may be more divesting by

integrated steelmakers of electric furnace plants which then become minimills.

CONCLUSIONS

U.S. minimills have achieved considerable success during the past decade in terms of profitability, increases in domestic market share, broadening of product mix and steady improvements in technological efficiency. The chief cause has been excellent management that has been able to capitalize on opportunities in the marketplace, technology, resources and labor. While there may be some impediments to continued growth, the likelihood is that the growth rate of the past decade will continue, essentially about 1 percent per year increase in market share and roughly 1 million tons per year production capability. By 1990 U.S. minimills could produce as much as 27 percent of domestic steel and make an important contribution to strengthening the U.S. steel industry. But maturity also brings challenges to sustaining rapid growth, and minimills may have to demonstrate their adaptability by, for example, joining together in a unified way to better present their story to both government and the public in order to maintain a competitive marketplace for steel.

Mr. SHAMANSKY. Thank you, Dr. Hirschhorn. I had the terrible feeling of deja vu as I heard your testimony. It seems that for the last 25 years, I will say, I have been reading about the steel industry just not being able to compete. It is behind technologically. They say that we are going to need *x* billion dollars and we have got to do all this, and they are behind continuously.

I thought that one of your most telling points was the fact that the dividend payments haven't been slipping. Is our steel industry being managed by the finance officers or by steelmakers?

Dr. HIRSCHHORN. Well, one of the findings of our steel study was that there seems to be a trend, over a period of perhaps more than a decade, that technical people were playing less of a role in the management of steel companies. Mostly what we see are MBA's and accountants and lawyers running——

Mr. SHAMANSKY. Look, it is OK to mention MBA's, but knockoff the lawyers. Let's get that clear. [Laughter.]

Dr. HIRSCHHORN. However, in fact, it is interesting to note that some of the more successful steel companies have a greater involvement, let's say, of technical people, particularly metallurgists, people who have worked in the plant who seem to be more committed to staying in steelmaking.

Mr. SHAMANSKY. However, somehow your language in here about what is needed—it is on page 6:

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What is needed is a concerted effort for the Federal Government to motivate the industry to investment commitments in rejuvenation of its steelmaking facilities over diversification investments.

At this late date, it seems to me that the Federal Government ought to say that apparently nothing can motivate these people if profit doesn't. In our system theoretically profit motivates them. Would you like to comment on that?

Dr. HIRSCHHORN. Yes. What we are saying, I guess, is that it certainly does not look good. The trends are fairly obvious. It does appear that there is an increasing commitment away from steelmaking. However, what we are also saying to you, particularly with regard to the theme of today's hearing, is that steel remains an absolutely essential material for the functioning of our society. We tend to take it for granted.

If the people who run the steel industry do not take into account the national welfare—the national needs—to a sufficient degree, then certainly the proper role of the Federal Government is to try to motivate them a little more.

Mr. SHAMANSKY. Yes, but do you motivate them by nationalizing them?

Dr. HIRSCHHORN. Well, I would hope not.

Mr. SHAMANSKY. I am not making the suggestion. I mean, we have had 25 years of trying to motivate them. Frankly, I am worried about the quality of the management.

Dr. HIRSCHHORN. As you clearly see, the quality of management is a major theme of our study. We feel that a very large part of the problem is, in fact, the management of the steel companies.

I do not have any easy answer for you except that we think that some mechanism at a high Federal level which would bring together, in an objective way, the needs of the industry—they have legitimate needs. We recognize their need to make money.

Mr. SHAMANSKY. Yes. I think it would be the function of management to point out their needs. I would think they would need say an increase in wages tied to increases in productivity.

The reason that I am mentioning this is that I am from Ohio. Youngstown labor—the United Steelworkers there—apparently were satisfied or bought off with increases in wages while no investment was made back into their plant until they suddenly woke up one day and there was no plant there.

Dr. HIRSCHHORN. Yes.

Mr. SHAMANSKY. Therefore, I am not absolving the historical or traditional view of labor in this country of not looking at management decisions. It has caught up with them there. Maybe they should have looked into how much money was put into the plant as distinguished from the hourly wage.

Dr. HIRSCHHORN. Yes.

Mr. SHAMANSKY. Maybe that would have made a big difference.

Dr. HIRSCHHORN. I would like to emphasize to you that it is easy always to talk about the industry as a whole and to make generalizations. However, within the industry itself one sees tremendous diversity in the quality of management, in the philosophies that the managers use, and the commitment to steelmaking, in the desire to take risks. Within the industry itself, I would say that there are some very, very competent people, some companies that

are better managed than others, and I think that with a little publicity given to a lot of these facts and analyses and some means to coordinate a Government policy, I think what you would provide is a mechanism for those who are more competent within the industry to have more influence.

Mr. SHAMANSKY. Well, that is why I was worried about a general policy applicable to all the industry. When some companies are doing better than others, why would we form some kind of policy that applied to all when maybe some of those managements should fail based on performance.

Dr. HIRSCHHORN. We have said that in our report, that we recognize that some plants are poorly located. Some plants are truly obsolete. They are not in the right market areas anymore. They should be closed.

Mr. SHAMANSKY. I made the point the other day when Mr. Margolin testified that when I was in college and took economic geography, a hallmark of a colonial economy was where they shipped out raw materials and imported finished products. We are now at the stage where we are shipping out raw materials and importing finished goods, whether it be for copper or wheat.

Dr. HIRSCHHORN. Yes.

Mr. SHAMANSKY. We are importing things. In Ohio we have got coal and iron ore on the Great Lakes, and cheap water transportation in the middle of the market, and the steel industry cannot compete with overseas' steel. There is no rational explanation for that. It does exist. I mean rational in the sense that I just cannot see why that should be.

Dr. HIRSCHHORN. Well, as I say, it is not a simple problem. There are many causes to explain the situation, but we would tend to emphasize the need not to offer money to the industry—that is not the answer—but to recognize that the problems lie within the industry itself to a great degree. When I suggest the need for Federal policy, please understand that I am not suggesting the need for direct funding.

However, I think that it is important to recognize—because we do all of us tend to take steel for granted—that should the Nation find itself in a situation where we are very, very dependent on imports——

Mr. SHAMANSKY. I do think you make the point very well, and I do not mean to slight it. I am so indignant about the other. Thank you.

Dr. HIRSCHHORN [continuing]. Yes.

Mr. SHAMANSKY. Mr. Andrews, United States Steel managed to find $6 billion plus in capital to acquire Marathon. I don't know. Could they have acquired $6 billion plus to make United States Steel competitive?

Mr. ANDREWS. No.

Mr. SHAMANSKY. They couldn't have.

Mr. ANDREWS. I am not privy to what was going on inside the books of the United States Steel Corp., but as I understand from what I have read and so forth, the attractiveness of that is the reserves of the Marathon Oil Co. That was what everybody was chasing after.

Mr. SHAMANSKY. Yes.

Mr. ANDREWS. Therefore, the financial community was willing to bet on that.

Mr. SHAMANSKY. Wouldn't the competitive gains to be derived from making steel more efficiently have been attractive?

Mr. ANDREWS. They evidently did not think so.

Mr. SHAMANSKY. I am looking at the track record. You know, their judgment calls over the last 20 to 25 years at least to me are not terribly inspiring.

Mr. ANDREWS. I will have no comment on that, Mr. Chairman.

Mr. SHAMANSKY. The reason I am asking is I know that your firm has been diversifying.

Mr. ANDREWS. Yes, sir.

Mr. SHAMANSKY. You have changed your name to Allegheny International to reflect the breadth of your activities.

Mr. ANDREWS. That is right.

Mr. SHAMANSKY. Yes.

Mr. ANDREWS. As with United States Steel. A very high percentage of their profits have come from the chemical industry.

Mr. SHAMANSKY. That is right. I have down here in the margin chemical and oil.

Mr. ANDREWS. Right.

A very high percentage of our profits come from outside the steel industry.

Mr. SHAMANSKY. Yes, but that seems to me to be really poor business to neglect your basic core business. It seems to me that you could well make the argument that we could be competitive there. It seems to me that they just turn their backs on their own basic industry.

Mr. ANDREWS. I think that probably from a stockholders return, an investment return on equity consideration, that is exactly where they arrived at. What are they in business for?

Unfortunately, it sounds very hard——

Mr. SHAMANSKY. Yes.

Mr. ANDREWS [continuing]. Very cold, very dispassionate, very unpatriotic, and very everything else.

Mr. SHAMANSKY. But that even includes just writing down the whole investment in their steel industry.

Mr. ANDREWS. It is highly capital intensive.

Mr. SHAMANSKY. Well, they have some responsibility for that.

Mr. ANDREWS. Oh, yes. They have full responsibility for it. I am talking about the industry now.

Mr. SHAMANSKY. Yes.

Mr. ANDREWS. The industry has a full responsibility for that. They let it slide in my personal judgment. However, you can see—and I think you can see in case after case—where the managements of those companies have said, "Where are we going? What is the best thing that we can do for the stockholders who have invested in this corporation? Why do we exist? Do we exist to make money or to make steel?"

Mr. SHAMANSKY. Before turning this over to my colleague from Michigan I just have one more area to question.

What Federal policies or programs are the highest priories in dealing with the problems of your industry? In this case, I am talk-

ing about your steel industry. What has the steel industry done to resolve its own problems?

I frankly think that based on the record, that it is sorry.

Mr. ANDREWS. Well, I don't think that I should even answer that question because we have got Dr. Hirschhorn here, and as you know, we have gone to the point where the steel industry is a very, very minor portion of our nearly $4 billion corporation.

Mr. SHAMANSKY. I was just thinking about your chatting amongst your colleagues. Is it the Duquesne Club that the——[Laughter.]

Mr. ANDREWS. I try not to go to the Duquesne Club too often.

Mr. SHAMANSKY. You might learn something.

Mr. ANDREWS. Well, maybe I should, yes.

Mr. SHAMANSKY. Not much.

Mr. ANDREWS. They are concerned—that is what John L. Lewis said a long time ago, "Not much." That is one of the reasons why I do not go there that often.

However, they, of course, are concerned about—the primary concern that I see that they are in is the impact of Federal regulations in the environment and these kinds of things. One of the major concerns that we had in the specialty steel industry—and still do have—is the foreign competition that is unfair competition. We have felt and said all along that we will stand toe-to-toe with anybody under the same rules. However, when he has got brass knucks on and we have got boxing gloves on, we tend to get our teeth kicked in. We are arguing, "Hey, let's make it a fair fight." We then have to stand toe-to-toe with anybody, and we believe that we can.

Mr. SHAMANSKY. Mr. Andrews?

Mr. ANDREWS. Yes.

Mr. SHAMANSKY. You will get no argument from anybody on this committee.

Mr. ANDREWS. Yes. I am sure of that.

Mr. SHAMANSKY. I frankly think, though, that has been trotted out so many times——

Mr. ANDREWS. Oh, yes. That is true.

Mr. SHAMANSKY [continuing]. That it is an alibi to cover ineptness.

Mr. ANDREWS. There is no question about it. The management records of at least portions of the industry—and the Doctor is right. You cannot speak categorically really because there are some very successful companies in the steel industry.

Mr. SHAMANSKY. Yes. I think that the idea that their refusal to be on the cutting edge of technology, the very short-term looking at every quarter that they have to raise the dividends to make sure that the investment portfolio managers are happy with the results is that they have simply been eating up their capital. They have simply been eating themselves alive.

Mr. ANDREWS. That is right.

Mr. SHAMANSKY. Congressman Dunn.

Mr. DUNN. Thank you, Mr. Chairman.

Dr. Hirschhorn, you go on through six pages of testimony to discount some of the problems that we have been talking about. Competition and high wages—some of the things that we have been

talking about over the years—aren't really the problems. You, I guess like Dr. Andrews, tied into the management practices, and you underscore in the last part that perhaps the proper role of Government is in the area of management technology.

I think that your suggestion goes far astream; that a minerals bill should somehow deal with better management technology for United States Steel. I don't think that you have done a very inclusive job of telling us exactly what the Government role should be in that better technology.

Would you like to see us fire all the management in the existing management of United States Steel or replace them with Government workers? Give us some specifics. What is the role that you want Government to play?

It is very easy to say to me, "I think we should have better management technology." That is nice, but where do we go from there? How does Government do that?

Dr. HIRSCHHORN. Well, I think that one of the critical needs that we focus on is the need to have better long-range strategic planning in the industry. The long-range strategic planning for an industry that is critical to the functioning of our society also demands that the Government play a role in this because the national welfare is at account here.

Therefore, what I am suggesting to you is that some high-level coordinating mechanism in the Federal Government could work with the management of the steel industry, work with labor, to develop a long-range strategic plan to cover 10 years or 20 years at least.

Mr. DUNN. Are you suggesting to me that the Federal Government does not fund engineering education as an example? That is long range. We made a big commitment to education a long time ago. That is where those people come from. What else besides training those people would you like to see the Government do?

Dr. HIRSCHHORN. Well, I think an appropriate Federal committee or council or whatever could outline how much steelmaking capacity is needed for the next 10 years, for the next 20 years, what kind of technological advances should be implemented more vigorously.

We have continuous casting in this country. We have about 20 percent of our steel made by continuous casting.

Mr. DUNN. Do you mean that Government people will know more about the new technologies than you? Is that what you are saying?

Dr. HIRSCHHORN. Well, let's say that they might motivate the companies. We have access to continuous casting technology at the same time other countries have. Now, Japan is making something over 60 percent of its steel by continuous casting. We are, among the major steelmakers of the world, way far behind in the use of available technology.

I think that the Federal Government could stimulate and motivate the management of steel companies to stay committed to steel.

Now, there are other roles of the Federal Government. I want to point out—we can give you concrete examples—how Government policies in the past have been contradictory.

Mr. DUNN. No; we are going to talk about where we go from here.

Dr. HIRSCHHORN. Well, I am suggesting to you that the council—the proposed council—or some mechanism like that could make sure that Federal policies did not have contradictory effects on a critical industry such as steel.

Again, I would give you examples in the case of continuous casting where Federal policy did not allow certain investment tax credits to be obtained by those steelmakers who wanted to invest in continuous casting. That was a good example of how the Federal Government stood in the way of some very necessary investments. Nobody was watching that kind of interaction between tax policies over here and implemention of technology somewhere else.

Mr. DUNN. One of the provisions that United States Steel did use on that Marathon deal was the safe-harbor leasing provision. Would it be a good idea to rewrite that to say that companies not in a profitmaking mode can only take advantage of safe-harbor leasing provisions if they intend to use the money for their basic manufacturing. The company could not use the funds to provide to Marathon Oil. Would that be a way to do it?

Dr. HIRSCHHORN. I think so. I testified sometime ago——

Mr. DUNN. That is the first concrete thing that you have said to me.

Dr. HIRSCHHORN. I gave testimony when the delayed compliance with the Clean Air Act came up. I said that the money that was generated from that delayed compliance should be spent on R. & D. as a long-range investment in the future for the steel industries. Nobody listened. We have said that all along, that if you do something like the leasing arrangement or delayed compliance that you put some strings on it.

Now, the industry has refused consistently to allow any strings to be put on anything. You can consistently see, as has been pointed out earlier, a trend of diversifying out of the industry and spending money in other ways rather than being committed to steelmaking. I would agree with you. That is an excellent example.

Mr. DUNN. Thank you.

Mr. SHAMANSKY. Thank you, Mr. Dunn.

I was going to have some questions for Mr. Mulready.

Mr. ANDREWS. Yes. He got a message for an urgent call from his office.

Mr. SHAMANSKY. I realize that. Mr. Mulready, you have just come back at the right time. That is perfect timing.

Mr. MULREADY. I am sorry. I had an urgent phone call.

Mr. SHAMANSKY. That is all right. The primary focus of the President's report was on domestic mining of materials with particular emphasis on public lands policy and regulatory reform. There has been some concern expressed about the failure to focus on such issues as industrial processing of materials, substitution, conservation, and other areas.

In your testimony you said that this was a very significant—the President's report was very significant and an important thing. Why is it so significant?

Mr. MULREADY. Well, I think as Mr. Andrews said it is a first step. It is a recognition that we have in fact a problem and that we ought to get at it. However, I think also, as he has stated, it does not go far enough.

Mr. SHAMANSKY. How would you change it? How would you move it along to where you think it ought to be?

Mr. MULREADY. I am an engineer.

Mr. SHAMANSKY. I will not hold that against you, sir. I just want you to be proud of that.

Mr. MULREADY. I am very happy to state that the problems in our industry are quite different from the steel industry——

Mr. SHAMANSKY. Yes.

Mr. MULREADY [continuing]. Our view of the major materials problem is that it is a transient rather than a steady state problem.

In the steady state circumstance, we really do not have a materials shortage. If we can keep the material flowing and make it available to the industries that need it, the true exhaustion of these materials really is a long, long way off. The thing that we must protect against is the temporary interruption which can occur for a variety of reasons, but whose impact on the productive capacity of the country is potentially very damaging.

The solution to that problem is a functioning national stockpile. It should work like an accumulator.

Mr. SHAMANSKY. Excuse me, I am not an engineer. What is an accumulator?

Mr. MULREADY. It is a device that absorbs excess material in times of low demand and supplies the transient excess demand during a time of peak requirements. That is what the stockpile should be.

Mr. ANDREWS. That is right.

Mr. MULREADY. It takes care of the problem when for some reason the supply doesn't match up with the demand. It is the major solution to the problem in this country, and its management is the thing that I think the Government should focus its attention on.

Mr. SHAMANSKY. However, right now, it is my understanding that the National stockpike can only be used in the event of a National emergency or declaration of war by the United States.

Mr. MULREADY. Yes.

Mr. SHAMANSKY. And the question is Pratt & Whitney or any of the United Technologies branches—I have a friend who has spent a whole career with Sikorsky—if there is a crisis overseas like in Zaire, that is not—it seems to me by the terms of our national stockpile law, that is not the kind of a crisis that would permit us to draw upon the stockpile.

Mr. MULREADY. Yes.

Mr. SHAMANSKY. However, clearly, it affects the whole supply.

Mr. MULREADY. We can have a very serious supply disruption without ever having had a declared national emergency. Therefore, I think that the stockpile system should respond to those interruptions in supply which occur for reasons other than those which result in a declared national emergency.

Mr. SHAMANSKY. Do you think that the President's report took notice of that?

Mr. MULREADY. Not to the degree that we would have liked.

Mr. SHAMANSKY. OK. Would you care to submit a letter or something highlighting or calling attention to that problem? We would make it part of the record without objection.

Mr. MULREADY. Yes. I would be happy to do that.

Mr. SHAMANSKY. I think it is a very important point, and I appreciate your mentioning it.

Mr. MULREADY. I feel very strongly about that.

[Material to be supplied follows:]

UNITED TECHNOLOGIES PRATT & WHITNEY AIRCRAFT

400 Main Street
East Hartford, Connecticut 06108

June 4, 1982

Mr. Robert H. Shamansky
Subcommittee on Transportation,
Aviation and Materials
308 Cannon House Office Building
Washington D. C. 20515

Dear Mr. Shamansky:

As you requested, during my testimony to the Subcommittee on Transportation, Aviation and Materials, on April 22, 1982, the following letter summarizes our view with regard to the need for reform of the strategic stockpile and its management.

Of the many facets of the strategic and critical materials problem which have been the subject of speeches, seminars and studies and much legislative activity, we have come to believe that the single most important factor is the need to improve the management of the national stockpile. It appears to us that there is no fundamental shortage in the world of our critical materials and with reasonable usage and the potential for discovery and improvement in recovery and reclamation, that supplies should be adequate for centuries. We also believe that in the normal course of events, that the economic process of the market will make these needed materials available to the user industries in the United States. The reason for our collective unease is that we are all concerned about the potential transient case where some force, external to the country, could deny our needed supplies of material for some period of time. The concept of a national stockpile of critical materials, for which we are dependent on foreign sources has been an obvious answer for the past four decades.

It is unfortunate, however, that while the concept is sound, the reality of the stockpile is that it falls far short of its potential value to the country. It has in fact been misused by past administrations and its mismanagement during the 70's was the major reason for the cobalt panic in 78-79. By altering the goal levels for cobalt, surpluses and deficits have been created overnight. During the 1950's the U. S. Government bought 83 million pounds of cobalt as partial satisfaction of a goal of 129 million pounds. In 1959 the goal was summarily reduced to 19 million pounds

and suddenly the stockpile had a 78 million pound surplus. Fifty-four million pounds were then sold between 1967 and 1977, supplying an average of 30% of the United States' annual requirements. In yet another dramatic reversal, the goal went from an all-time low of 12 million pounds in 1973 to its present goal of 85 million pounds in 1976, once again creating a deficit. This inconsistent stockpile policy was the major reason for the cobalt shortage in 1978/79. The Zairean supply was put on allocation, but in fact there was no major damage to the mines, and the Zairean production goals for 1978 were slightly exceeded.

These changes in stockpile goals and inventories have been disruptive for both producers and users. Stockpile sales were curtailed in 1977 with no warning and it took time for new sources to be developed. The cobalt shortages of 1978 and 1979 were, for the most part, self-inflicted and resulted from an inconsistent stockpile management policy.

We believe that consolidation of stockpile responsibility and authority is essential. This central authority must reside in an independent body such as has been proposed by Senator Harrison Schmitt in the Strategic Stockpile Reform Act (s.1982). Such an organizational structure would enable the stockpile to be managed in an environment isolated from political pressure, and with long-term national objectives in mind.

I appreciated the chance to testify before the Committee on this critical issue and would be happy to answer any further questions which you might have.

Sincerely yours,

R. C. Mulready
Vice President, Technology

mat

Mr. SHAMANSKY. How do you view the coordination of the materials policy through the Cabinet council? Has it been effective, and do you feel that it will adequately address other aspects of materials policies than minerals? There seems to be such an emphasis on minerals in the President's report in the Cabinet council suggestion.

Mr. MULREADY. I am sorry. I have an ear blockage from the flight this morning.

Mr. SHAMANSKY. OK. How do you view the coordination of materials policy through the Cabinet council?

Mr. MULREADY. I think that they are doing quite a good job now, but I am also worried about the long term. I think it was Mr. Pendley of the Interior Department who said that this was the first administration since Eisenhower that really paid any attention to the materials problem. I think that we need a structure that will function over the long term, a long-range policy on the basis of law as Mr. Andrews has said.

Mr. SHAMANSKY. Do you think that the bill—the legislation that we have been alluding to—would do a better job or do you think that the Cabinet council is sufficient?

Mr. MULREADY. I think that the problem is larger than that. As I said in my testimony, the best approach to the overall problem that I have seen is the one proposed by Senator Schmitt in the Senate bill 1982.

Mr. SHAMANSKY. I want to thank the witnesses for their testimony and their responses to our questions. We will go to the next panel. Thank you, gentlemen.

Mr. Lubin and Dr. Mueller, welcome to the committee.

As shown on the identifying card, on a purely personal note, are you any relation to a Mr. Harold Lubin of Columbus?

Mr. LUBIN. No, I don't think so.

Mr. SHAMANSKY. OK. He is a very distinguished physician. I just thought that I might inquire.

If you would like to begin your testimony, sir, we would be glad to receive it.

STATEMENT OF GEORGE LUBIN, SOCIETY OF THE PLASTICS INDUSTRIES, INC.

Mr. LUBIN. Thank you very much. Mr. Chairman, distinguished members of the subcommittee, my name is George Lubin and my credentials are that I have spent almost a half a century in the plastics industry. I am representing the Society of Plastics Industries. I am here to testify on behalf of Public Law 96-479 and H.R. 4281.

The Society of Plastics Industry, whom I am representing, includes about 1,200 member companies. It is a company organization. It is the major national trade association of the plastics industry. Its membership represents over 95 percent of the production and about 75 percent of the plastics materials sales in the United States. A major operating unit of the society is the Reinforced Plastics/Composites Institute, formed in 1944, comprising 312 companies that mold fiber-reinforced plastics products, supply raw materials or equipment for production of such products, or purchase

them for fabrication and assembly into finished goods such as aircraft, trucks, automobiles, boats, and so on.

Although SPI did not participate in the developments which led to the passage of Public Law 96-479, we have more than idle interest in the subject of critical materials.

On my own, I would like to add that we are a very healthy industry. We have no apparent critical materials problems. We have no apparent management problems. We have a very bright future. Any problems that we have are minor. In fact, many of the metal companies, subscribing to the motto, "If you can't lick them, join them," have taken a great financial interest in the plastics industry.

The only problem that we do have is in boron filaments which we use sparingly. The core of boron is tungsten and the supply of tungsten does give us somewhat of a problem. However, that is the only case that I know of where we do have a problem with critical materials.

The plastic industry—and specifically the reinforced plastics branch of this industry—since 1940 has become a major supplier for materials in our economy. It has progressed faster in that time than any other industry that I know of with the possible exception of electronics with computers.

This typical role of plastics is not limited to the household uses on which we have become so dependent and so familiar with. We are now also a principal supplier of critical materials for a whole range of products.

To illustrate, I will cite some examples and show some slides of how plastic materials—primarily fiberglass and some advanced composites—are used today.

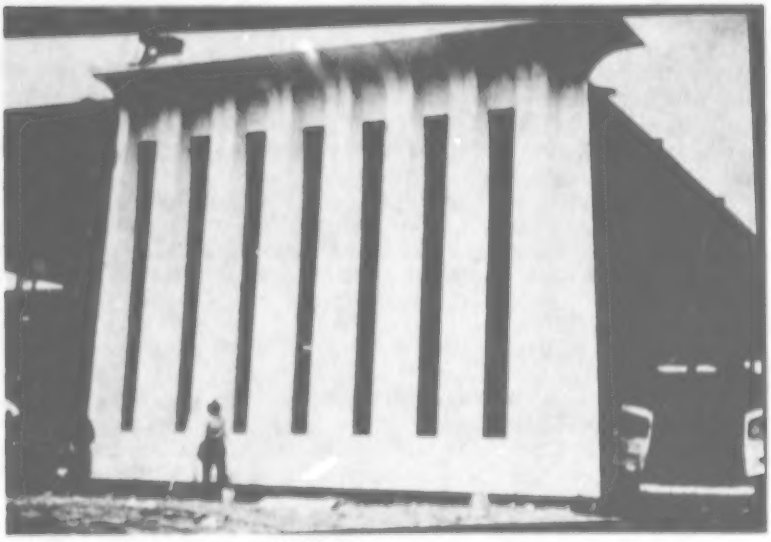
Advanced composites are materials which consist of fibers and resins. There are three primary fibers: Boron, which is a metallic fiber; qraphite, which is made by burning out all the impurities from rayon or acrylic fibers; and kevlar which is an organic fiber developed by DuPont originally for tires and which found a very large use in our industry.

The first item that I am going to discuss is boats. The use of fiberglass boat started almost as soon as the fiberglass industry became an industry. It required no machinery. The boats are easy to fabricate. You just lay up your fiberglass and the resin in a simple mold and you can make excellent boats. Of course, the industry has become very much mechanized, but the basis process is still very similar to what we used to have.

The boat industry has had such tremendous growth that the production of wooden boats has been almost eliminated. It reminds me of an incident. Again, you were talking so much about South Africa. The South African Government at one time decided to choose between three types of boats: metal (aluminum), fiberglass; and wood. They couldn't decide so they constructed one of each and sent them out on maneuvers. There was a very severe storm and the metal boat and the fiberglass boat collided. The metal boat sank. Therefore, the South African Navy and the Government now use primarily fiberglass boats.

Then we have building construction materials which is a tremendous industry in itself. Here is a typical example of a building front.

[Slide 1 shown.]



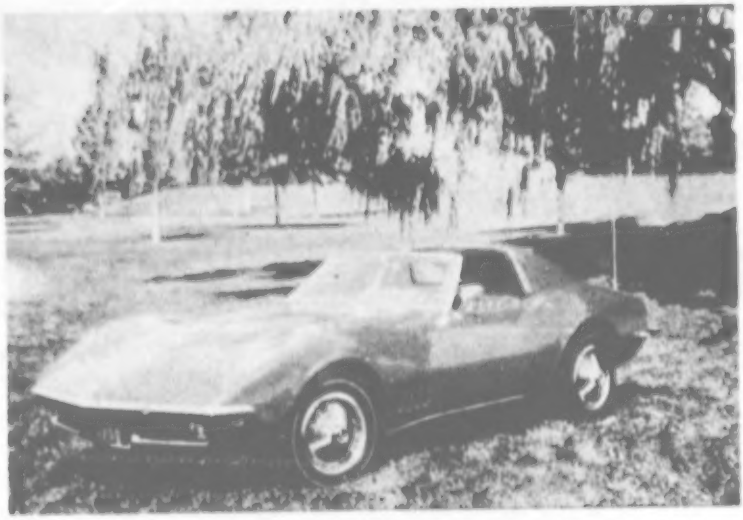
Mr. LUBIN. The panels comprising the front are about 6-feet wide and about 25-feet long. They are made in very simple molds with the color molded in. You never have to paint it. The material is light. It is noncorrosive. It resists all kinds of atmospheric conditions, and it can be considered permanent. It is also very inexpensive to fabricate. This type of construction is finding more and more uses as we go along.

Composites, again, are used in roof trusses and in bathrooms. Most of all modern construction in bathrooms consists of complete units which are all fiberglass. The bathtubs are all fiberglass. The sinks are fiberglass. Even toilet seats occasionally are fiberglass.

Practically all new mobile homes are made out of fiberglass. Correpated roofing and corregated patios are common.

Automotive products have a tremendous future. Pertaining to car bodies, the Chevrolet Corvette is now known all over the world. There are hoods and grills such as the one that you see on the slide.

[Slide 2 shown.]



Mr. LUBIN. There are engine mounts, truck cabs, and bodies.

The new Ford engine which is being developed by Ford using graphite has only a few metal parts. The block liners, the cams, and the pistons are metal. The remainder of the engine is graphite composite. The weight savings are going to be spectacular and so will the mileage.

Mr. LUBIN. This is one of the most interesting of the future applications—even present applications. The composites, as we know, are similar materials to metals. However, the advanced composites that I mentioned have one peculiar property which is unique. These materials have a fatigue strength which is so high that essentially they are fatigue free. They do not fatigue. The effect of fatigue as you can see—when you fly in a plane, you see the wings go up and down, and you wonder how long is that going to continue before it breaks off. Well, these materials can go on indefinitely. Their fatigue strength is almost equivalent to their static strength. Normal materials such as aluminum or fiberglass have a fatigue strength of about one-quarter of their initial strength. You have to supply a factor of safety of four. In other words, you have to increase the weight four times before you use them.

Graphite, boron, and kevlar are designed with maybe a 10- to 15-percent margin of safety, and you have a very light structure.

Now, the springs, of course, have an ideal application for cars. They are using them more and more, and the weight savings are spectacular.

Next slide, please.

[Slide 3 shown: Weight savings with composites.]

Weight Savings In CRP Components

Component	Weight In Steel (Lbs.)	Weight In CRP (Lbs.)	Weight Savings Per Vehicle (Lbs.)
Car Leaf Spring	28	4.5	47
Heavy Truck Leaf Spring	125	30	380
Car Driveshaft	17.5	12.0	5.5

Mr. LUBIN. An ordinary spring weighs about 38 pounds in steel. It weighs 4½ pounds in graphite. The weight savings for a car is 48 pounds. For a truck, the spring weighs 125 pounds. It weighs 30 pounds in composites, so the weight savings for a truck is 380 pounds which is a considerable amount of weight not to carry.

Next slide, please.

[Slide 4 shown.]

Mr. LUBIN. In aircraft, one of the greatest applications for composites are in the 747 which you see there. Interestingly enough, the main problem in reinforced plastics is acceptance. We found a long time ago that they are cost-effective and weight-effective, but the public seems to be afraid of seeing a fiberglass skin on a plane especially a commercial plane.

The 747 has 10,000 square feet on the outside surface. The way it is made is they spray a thin layer of aluminum on the mold first, and then back it up with a heavy layer of fiberglass. Essentially, it is fiberglass with an aluminum surface. It looks like aluminum, but it is fiberglass.

[Slide 5 shown.]

Mr. LUBIN. For some of the future planes like the 767, the colored sections show where the advanced composites are used. The big or orange glob in the middle is the floor of the plane. It is all kevlar. The aft sections of the tail and wing are graphite composite.

The interesting thing about this plane is it is made all over the world. The sections are made by companies in Spain and Italy and Germany and Holland and England and the United States and in Japan. It is subcontracted by Boeing so it is really a United Nations plane.

Next slide, please.

97-007 O - 82 - 13

[Slide 6 shown.]

Mr. LUBIN. Here is a military plane. It is an E2C. The E2A which was the first edition of this had the first fiberglass safety-of-flight tail installed on it. The rotodome—it is actually an AWACS-type aircraft. It is an airborne detection plane. The size of this dish in the middle is 24 feet in diameter. The tails that you see in the back are also fiberglass to allow the radar to go through. This plane was the first one to use fiberglass structurally in production on heavily loader parts.

The interesting thing about fiberglass—everybody wants to know how——

Mr. DUNN. Can I ask you a question?

Mr. LUBIN. Yes.

Mr. DUNN. Do you know why that aircraft has so many vertical stabilizers?

Mr. LUBIN. I beg your pardon?

Mr. DUNN. Do you know why that aircraft has so many vertical stabilizers—tails.

Mr. LUBIN. Tails? I was in on the design of that. Now, let me recollect. There are four tails, three of which are articulated, and the fourth is a slab fin. Aerodynamically, because of the presence of the rotodome, it was found necessary to put four rather than the normal two tails.

Mr. DUNN. Thank you.

Mr. LUBIN. You are welcome. Therefore, this plane has been flying around for about 20 years, and we were fortunate to find one rotodome which was discarded after modifications. We cut it up and we tested it, and we found that the strength degraded very little. Any part of the plane where the paint pealed off had some degradation. Where the paint was intact—after 20 years of severe flying through all kinds of atmospheric conditions, through several wars actually, we found that this material did not degrade. This

was something that we did not know very accurately in our industry. We had laboratory test data but not actual long-term service performance for reinforced plastics for aircraft use, and we found that it was spectacular. We cut up sections of other planes and we found the same thing. There was practically no strength reduction if the composite was properly protected with paint.

Next slide, please.

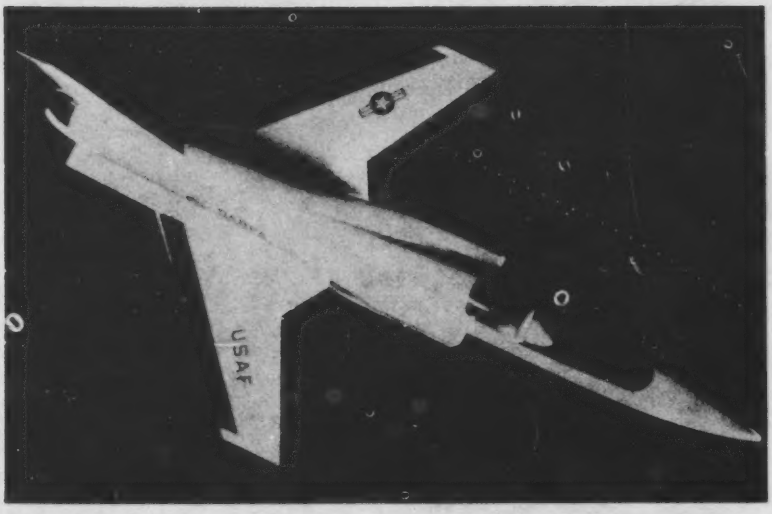
[Slide 7 shown.]

Mr. LUBIN. This is a commercial plane. It is a Lear Fan which is about 95 percent graphite composite. This is the latest addition to our air fleet, and the mileage which you get on this plane is almost equivalent to what you get in a car. In other words, they get 10 miles per gallon which is quite impressive.

This is one of the first prototypes, and this plane has a tremendous future. There was a similar plane, by the way, made by Windecker Aircraft in Texas. There was an interesting thing that happened to it. It flew from Midland, Tex., to Dallas, and as they approached the airport the pilot asked for instructions for landing, and the controller asked them "Where are you?" Pilot said, "We are just approaching the airport." Controller replied, "We can't see you. Fly around some more." They flew around some more. But the tower couldn't pick them up because fiberglass is transparent to radar. The plane finally had to return to Midland. Therefore, if you make these planes, you have to put some special metal foil around them so they can be picked up on the scope.

Graphite, however, is not quite as bad as fiberglass. It is not transparent to radar. You have probably heard about Stealth Aircraft which is completely invisible to any radar pickup.

[Slide 8 shown.]



Mr. LUBIN. OK. This is the latest design in aircraft. This is the forward swept-wing aircraft where the wing is tilted backward as you see. This was designed for the greatest maneuverability. This plane is being designed and built by Grumman Aerospace, and it is expected to be faster and much more maneuverable than any other aircraft in existence.

The wings take on such tremendous loads that the only possible way they could build it is by using the new advanced composites which have tremendous stiffness and strengths.

Just to give you an idea of the stiffness, the stiffness of steel is 30 million pounds per square inch. The stiffness of graphite fibers approaches 75 million, so it is much stiffer.

When you add resin to the fibers to produce a composite, of course, the modulus is decreased. It is still a material which is one-fifth the weight of steel but is as stiff or even stiffer. Therefore, it offers aircraft designers quite a tremendous payoff.

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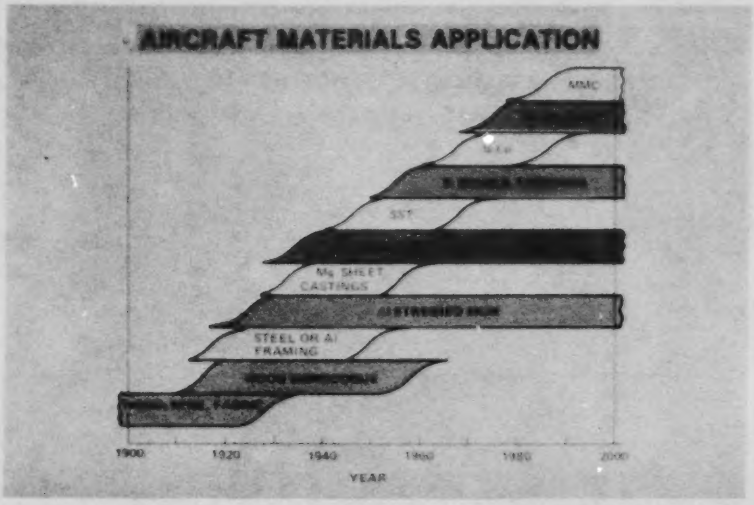
[Slide 9 shown.]



Mr. LUBIN. Here is the history of material applications in aircraft. It started with fabric and wood. It went to wood monocoque to a steel structure to aluminum to magnesium castings, and finally to all types of resin-base composites and later metal matrix composites which is expected to be used much more around the year 2000. This is the progress in aircraft materials. If you have any questions on this, I will be glad to answer them later.

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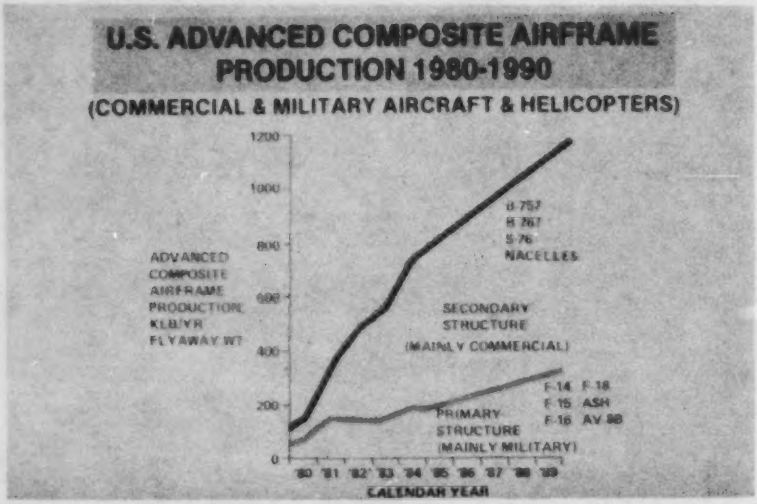
[Slide 10 shown.]



Mr. LUBIN. This is the expected growth of the application of composites in the airframe structure, both primary structure and secondary structure. The use of composites in the primary structure will probably double by 1989, and in the secondary structure almost 10 times the present use.

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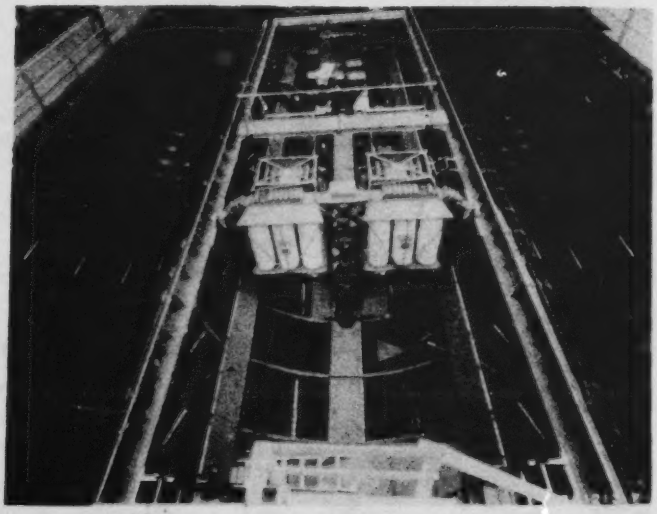
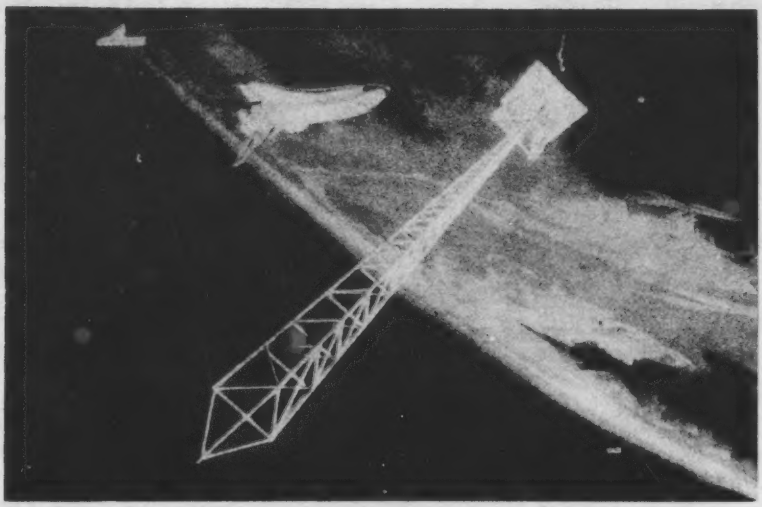
[Slide 11 shown.]



Mr. LUBIN. This is an interesting application. This is the Space Shuttle. The cargo doors of the Space Shuttle are all graphite. They are very lightweight, completely corrosion resistant, and durable. Also, the tiles are bonded on with a plastic-ceramic adhesive.

Next slide, please.

[Slide 12 shown.]

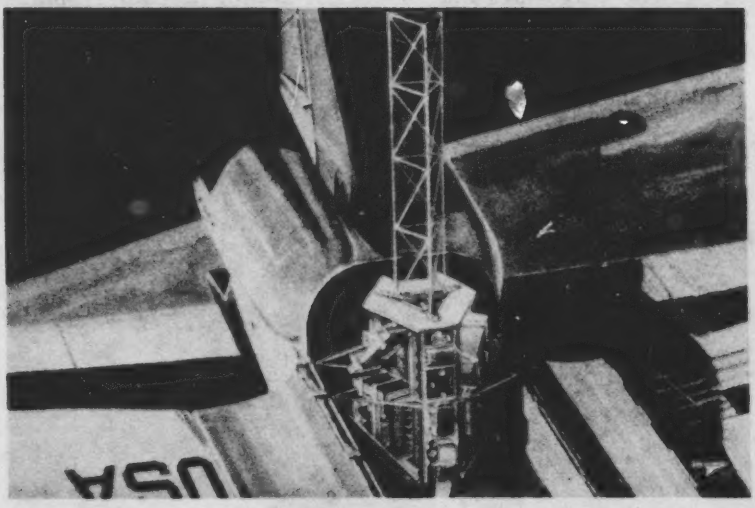


Mr. LUBIN. This is going somewhat into the future. This is a new NASA project of generating energy in space. NASA discovered that if you put solar mirrors in space where you don't have the atmosphere, you get much higher efficiency in generating energy. They came up with a program to make a large truss with solar mirrors and station it in space. The only way something like this would be feasible is to build it on a Space Shuttle. The sizes are just astronomical. The size of the truss is expected to be something like 3 by 9 miles.

Mr. SHAMANSKY. Miles?

Mr. LUBIN. Miles, right. It is a very lightweight structure. The structure is made in this form. This is one of the trusses.

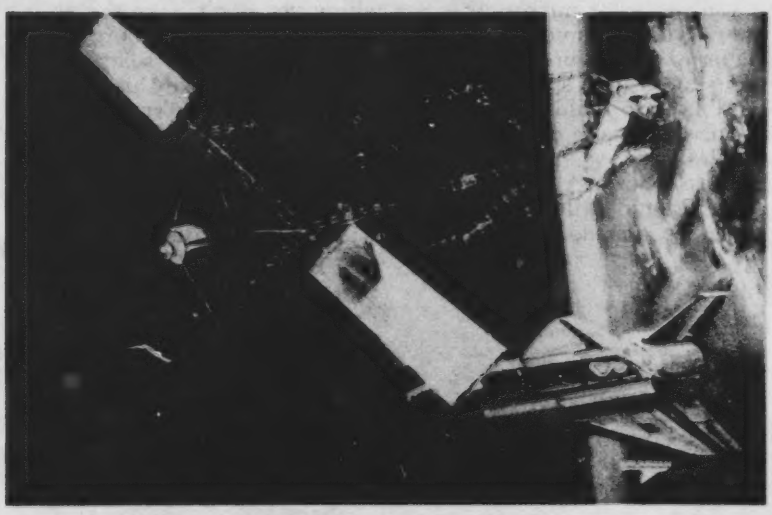
[Slide 13 shown.]



Mr. LUBIN. It is made on a machine installed in the Shuttle. In fact, this machine is in existence. NASA has it. Grumman designed it. I was with Grumman at the time. We tried it out and it worked fine.

After the truss is made, a section of this truss—here is the full truss—can be miles long. The trusses are combined—next slide——

[Slide 14 shown.]



Mr. LUBIN [continuing]. Into finished solar stations. This is the station that could be 3 by 9 miles with the solar mirrors.

The interesting thing about this is it started in aluminum, using aluminum tape which was delivered to the Shuttle in the shape of spool. The aluminum was formed into structural shapes, welded into those trusses, and then they found out that the aluminum expands and contracts as the Sun changes angles, so that when they tried to beam the microwave energy to Earth, it could miss the receiving station. They couldn't have that because it could burn up a large area. Therefore, they asked for a material that has a zero coefficient of thermal expansion. In other words, it shouldn't change in dimension from temperature. Graphite composite is such a material. Graphite composite is completely stable. No matter how much you heat it or cool it, the dimensions don't change. The new units, therefore, are being made in graphite composite by a different type of machine, and a section of that structure is on the table over there.

This can soon become a reality—incidentally, the Japanese Government is negotiating with NASA in building the first one over the city of Tokyo. If this is a success, the estimates are that it will take care of about one-third of the power requirements for this city. That is planned for the year 2000.

The reasons fiberglass-reinforced plastics are preferred for these applications are because of their high strength, lightweight, corrosion resistance—they don't rust—and ease of fabrication.

The manufacture of these plastics involves taking thin layers of glass fabric or glass tape and laying them up in the proper thickness. First, we precut them in the proper shape and we lay them up and we mold them. What that means is that our scrap rate can run as low as 3 to 4 percent.

Now, if you take metal shapes and machine them—take titanium, for instance—sometimes you have a 90-percent scrap rate in titanium. Therefore, the cost of the material becomes very, very high. Here the scrape rate is so low that in spite of the fact that plastic composites are more expensive, we can come up with a comparable finished part cost.

The fabrication of composite plastics alone is a multimillion-dollar industry with firms fabricating parts in the United States, Japan, Spain, Italy, Germany, Holland, and England primarily. This is for advanced composites, but there are fiberglass industries all over the world including India, Hong Kong, and other undeveloped countries.

Also, in the energy-generation field composites offer tremendous potential in two ways. The energy storage flywheels—you have probably heard of those—are under tremendous stress when they go on full speed. Plastics offer the only materials which are light enough and strong enough not to fall apart. The wind generators have blades—fiberglass blades—presently which are as long as 150 feet long and expect to go even longer primarily because of the lightweight.

Looking to the future, some in our industry have projected that graphite fiber reinforced matrix composites will eventually replace many metal structures, while graphite fiber reinforced aluminum may replace titanium and steel in products such as jet engines fan

blades. Corrosion and heat-resistant ceramic and glass matrix composites reinforced with silicon, carbide, and graphite fibers could replace high-chronium- and high-cobalt-content nickel base superalloys. Some specific examples of potential applications of high-performance composites are cited in the appendix.

The use of plastics materials depends upon oil and natural gas as a source of raw materials of which we will use only a small percentage. Actually, less than 2 percent of the total is used for the plastics industry. There will continue to be secure domestic sources of these raw materials for many years to come. As a recent study by Franklin Associates has indicated, "For most end-uses, plastics products require less energy to manufacture and use than equivalent products made of alternative materials."

SPI's comments of October 12, 1981, to the Department of Commerce Task Force on Public Law 96-479 recommended the establishment of a central data reception office within the Goverment to help fulfill the intent of the law. A copy of our comments are attached. The Office of Strategic Resources in the Department of Commerce has assumed that role. In January, our members received a request for information from that office and are in the process of preparing responses.

We believe there is a crucial role for the Federal Government in coordinating policy and stimulating programs on critical materials. However, the plastics industry continues to support a principal reliance on the private enterprise system for developing needed new materials. This includes, to the maximum extent possible, the free flow of scientific and technical information. The SPI hopes that Public Law 96-479, and any subsequently enacted critical materials legislation, will be administered with this in mind.

Just on my own behalf, apart from SPI, I would like to comment on present efforts by the Government on information control. I have been very active in the international field, both with European and Japanese firms and with Russian scientists. There are, outside of metal composites, practically no developments in composites where we in the United States have exclusive know-how. The major advances and discoveries have been completely documented in publications and scientific meetings to which all scientists and engineers have access.

The only proprietary information that should not be disclosed are the specific processes developed by the U.S. companies for their own use which should remain restricted. Most of the developments in the composite field, however, were paid for by the Government—military amplications—and they must be made available by law to the competing companies.

Due to the present information exchange, the discoveries and developments abroad are shared by American companies. On my recent trip to Europe, last September, I visited many composite manufacturers and the only restricted areas were military design, not materials or processing.

During my trips to Russia—I have been there several times—in 1977 as a guest to their Academy of Sciences, I was shown an operation where boron/aluminum jet engine blades were being fabricated using equipment which was an exact duplicate of what I had seen in the United States. This process was extremely restricted in

the United States, and the Russians showed me our restricted operation. The machine was identical to the one that I saw at Hamilton Standard.

In Riga, Latvia, in the U.S.S.R., there is an institute where in one place they have over 200 stress analysts working on the design and development of composites. I do not believe that we have that many in our entire industry. Because of my visit there, publications by this institute are regularly sent to me by Russian scientists for my information which I make available to all interested scientists and to our Government which translates them into English. One copy of such book will be published soon in New York.

However, it is interesting that Russia lags behind us in applications due to fear of failure. Here if you have a new process or a new material, you can introduce it to the public and if it works, fine. If it doesn't work, back to the drawing board. It doesn't work that way in Russia. It is back to Siberia. [Laughter.]

Therefore, the Russian scientists are very reluctant to try something new. All their techniques are developed, and they are waiting for somebody to give them a push. They do not like to stick their necks out. That is why they do lag behind us in plastics and composites.

Now, here is something that is very important: Excessive restrictions on the distribution of information on composite materials and processes does not accomplish anything besides stifling information flow between interested parties in the United States. Information on design and novel military applications should, naturally, still remain classified.

We have had lately a tremendous push on additional censorship. There are articles and papers which have absolutely no strategic or military importance which are scrutinized and very frequently are canceled or refused publication for some reason by groups in the military who have no idea—what—they contain.

I published a book about 10 years ago with a chapter written by a Navy employee. The Navy refused to approve it. I sent it to the Navy censorship several times requesting clarification of what was classified there. They would not give me any information. Finally, I went to the Assistant Secretary of the Navy, and he applied pressure, and the book was released. They took out one picture that was supplied by Owens Corning of a pleasure boat.

This just shows what—anyway, to me—is a problem. It is this flow of information which has made our industry develop so fast. If we have a new idea, we share it. It may be peculiar to our industry, but it works. It works very well, and we are very happy with it. Without this idea—sharing—we could never have developed the present state of technology which is the highest in the world.

In conclusion, the SPI is encouraged by the leadership role of the Federal Government in critical materials policy. We appreciate the steps that have been taken to stimulate the development and use of alternative materials, including plastics. We believe the plastics industry has an important contribution to make to this Nation's materials security and we would welcome future opportunities to present our views to the Congress.

If I may have your indulgence for a few more words of my own again—I can make this available to you if you are interested—

Public Law 96-479 and H.R. 4281 lean very heavy toward mining and metallurgy and related materials. I feel that equal emphasis is required toward nonmetallic materials, especially plastics composites and chemical materials.

If 4281 is enacted, a special effort or division is needed to run private and Government research activities and to determine and eliminate duplication. Much too frequently, both private companies and Government agencies authorize or perform development and research work of great importance which, if not published, will eventually be duplicated by another organization.

A directory of research and development projects should be published regularly and should be consistently updated to prevent such duplication.

I have just one more thing before I leave which I was thinking about recently. Plastics is an interesting happening in our life. We have had four ages of man: Stone Age, the Bronze Age, the Iron Age, and now we are in the Plastics Age. From birth to death, we are surrounded by plastics. When a baby is born, he gets put into a plastic crib. He gets fed with a plastic bottle. When he grows up, he is dressed in plastics. He is fed from plastic utensils. He sits on plastic furniture. He lives in plastic houses. He travels in plastic cars, and gets eventually buried in a plastic coffin.

Thank you.

[The prepared statement of Mr. Lubin follows:]

Testimony Of

GEORGE LUBIN

Representing

THE SOCIETY OF THE PLASTICS INDUSTRY, INC.

Before The

Subcommittee On Transportation, Aviation And Materials

And The

Subcommittee On Science, Research And Technology

Of The

Committee On Science And Technology

United States House Of Representatives

Concerning

The National Materials And Minerals Policy, Research

And Development Act of 1980

April 22, 1982

Mr. Chairman, distinguished members of the subcommittee. My name is George Lubin. I am here today to present the views of The Society of the Plastics Industry's (SPI) Reinforced Plastics/Composites Institute on P.L. 96-479, the National Materials and Minerals Policy Research and Development Act of 1980 and H.R. 4281 the Critical Materials Act of 1981.

The Society of the Plastics Industry, Inc. includes 1,200 member companies and is the major national trade association of the plastics industry. Its membership represents over 95% of the production and about 75% of the plastics materials sales in the United States. A major operating unit of the Society is the Reinforced Plastics/ Composites Institute, comprised of 312 companies that mold fiber reinforced plastics products, supply raw materials or equipment for production of such products, or purchase them for fabrication and assembly into finished goods such as aircraft, trucks and automobiles.

Although SPI did not participate in the developments which led to the passage of P.L. 96-479, we have more than an idle interest in the subject of critical materials.

The industry in its relatively brief history has become the major supplier of materials in our economy. This pivotal role of plastics is not limited to the household uses with which we have all become so dependent and familiar. We are now also a principal supplier of critical materials for a range of products.

To illustrate, I will cite some examples of how a plastics material - fiberglass - is used today:

- Boats. The use of reinforced plastics has almost replaced the use of wood and metal for hulls from canoes to minesweepers. (Slide)
- Building and Construction Materials. Composites are used in building walls, roof trusses, bathrooms, bathtubs, sinks, mobile homes, corrugated roofing and patios. (Slides)
- Automotive Products. Car bodies, hoods, grilles, engine mounts, truck cabs and bodies. (Slides)

I have included additional examples in the Appendix attached to my testimony.

The reasons fiberglass reinforced plastics are preferred for these applications are because of their high strength, light weight, corrosion resistance and ease of fabrication.

Composite plastics combine several materials in layers to achieve unique characteristics, such as light weight, fatigue strength (higher than any other materials), and stiffness. Furthermore, there is almost no waste during the manufacturing process.

The fabrication of composite plastics alone is a multi-million dollar industry with firms fabricating parts in the U.S., Japan, Spain, Italy, Germany, Holland and England. (Slide)

In the energy generation field composites are used in energy storage flywheels, in fission energy generators for coil insulation, and for wind energy blades. (Slide)

Looking to the future, some in our industry have projected that graphite fiber reinforced matrix composites will eventually replace many aluminum structures, while graphite fiber reinforced aluminum may replace titanium in products such as jet engine fan blades. Corrosion and heat resistant ceramic and glass matrix composites reinforced with silicon, carbide and graphite fibers could replace high chromium and high cobalt content nickel base superalloys. Some specific examples of potential applications of high performance composites are cited in the appendix.

The use of plastics materials depends upon oil and natural gas as a source of raw materials. There will continue to be secure domestic sources of these raw materials for many years to come. And, as a recent study by Franklin Associates has indicated, "for most end-uses, plastics products require less energy to manufacture and use than equivalent products made of alternative materials."*

Franklin Associates, Ltd., "Plastics: The Energy Saver." Prarie Village, KS, 1981

SPI's comments of October 12, 1981 to the Department of Commerce Task Force on P.L. 96-479 recommended the establishment of a central data reception office within the government to help fulfill the intent of the law. (A copy of our comments is attached.) The Office of Strategic Resources in the Department of Commerce has assumed that role. In January our members received a request for information from that office and are in the process of preparing responses.

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Just on my own behalf, apart from SPI, I would like to comment on present efforts by the Government on information control. I have been very active in the international field, both with European and Japanese firms and with Russian scientists. There are, outside of metal composites,

practically no developments in composites where we, in the United States have exclusive know-how. The major advances and discoveries have been completely documented in publications and scientific meetings to which all scientists and engineers have access.

The only proprietary information that should not be disclosed are the specific processes developed by U.S. companies for their own use which should remain restricted. Most of the developments in the composite field, however, were paid for by the Government (military), and they must be made available (by law) to the competing companies.

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In Riga, Latvia, (Part of U.S.S.R.) there is an Institute where in one place they have over 200 stress analysts working on the design and development of composites. I don't believe

we have that many in our entire industry. Publications by this Institute are regularly sent to me by Russian scientists for my information. A translated copy of one such book will be published soon in New York.

Excessive restrictions on the distribution of information on composite materials and processes does not accomplish anything besides stifling information flow between interested parties in U.S. Information on design and novel military applications should, however, still remain classified.

In conclusion, the SPI is encouraged by the leadership role of the Federal government in critical materials policy. We appreciate the steps that have been taken to stimulate development and use of alternative materials, including plastics. We believe the plastics industry has an important contribution to make to this nation's materials security and we would welcome future opportunities to present our views to the Congress.

APPENDIX

Examples of Plastics Fiberglass Products

- Machine construction. Engine covers, supports, frames, conveyors, telephone cranes, etc.

- Transportation. Railroad cars, buses, subway cars, trailers, large shipping containers.

- Chemical industry. Fume hoods, processing chambers, gasoline storage tanks, waste treatment tanks.

- Aircraft. Small planes - Windecker Eagle, Piper Cub. Passenger aircraft - Boeing 747 has 10,000 sq. ft. of fiberglass on outer skin. Military aircraft - radomes, Grumman E2-C tails, etc.

- Submarines. The forward section of each modern submarine is a sonar dome 24 to 36 feet in diameter.

Examples of Future Potential Applications of Plastics Composites

Army - Tanks, gun barrels, armor, portable bridges, portable, quick erectable housing, office modules laboratories.

Navy - Ship deck structures, submarine components, hydrofoils.

Air Force - STOL aircraft, forward swept wing aircraft - this is the most maneuverable aircraft, superior to any existant type, the advanced technology bomber.

NASA - Space energy generating structures of very large dimensions, 3 by 9 miles, to be built in space using machinery installed on the space shuttle.

Automotive - Light weight springs and drive shafts. Ford Co. is working on a new composite engine for cars where only the cylinder liners, valve springs, exhaust valves, camshaft, crankshaft and some bushings are made in metal.

The Society of the
Plastics Industry, Inc.

355 Lexington Ave
New York, New York 10017
(212) 573-9400

October 12, 1981

Mr. J.B. Wachtman, Jr.
Vice Chairman - DoC Task Force on PL 96-479
U.S. Department of Commerce
National Bureau of Standards
Washington, D.C. 20234

Re: P.L. 96-479, the National Materials and Minerals Policy, Research and Development Act of 1980 - report due Congress on 21 October 1981.

Dear Mr. Wachtman:

This communication is intended to supplement "Advanced Materials Section of DoC Report on Critical Materials Needs of the Aerospace Industry." We are submitting comments in the interests of strengthening consideration of the role to be played by organic composites in the aerospace, defense, energy, marine, and transportation industries in the coming decade and beyond.

The enclosures, exhibits, and attachments selected for transmittal here illustrate the potential range of application for polymeric materials reinforced with glass, high-strength (S-2) glass, carbon, aramid or other fiber reinforcements.

While the DoC report is an excellent survey of published sources, organic composites are an emerging technology. Many of its achievements are undocumented for proprietary, or Classified reasons; because extended use or ageing experiments are not quite complete; or even because volume production techniques are not de-bugged although the product itself is proven. In this respect, composites technology is competing for the same hard commitment and capital infusion being sought by proponents of reindustrialization grants to old technology.

Components differ from better known engineering materials, however, in that they are becoming the materials of choice for strategic design. Many properties, advantages, and economies of organic composites - particularly in hybrid forms (e.g. glass/carbon) - make them superior as systems for the life of the part. In other words, not merely is substitutability of interest but also improved performance.

We are keenly aware of the deficiency shared by DoC's projections for composites and our own. Namely, that without more aggressive investment in multiple-source suppliers, their potential remains widely unknown. Conversely, it is precisely wide appreciation that is first required in order to generate the commitment.

SPI strongly recommends, therefore, that a central data reception office be established to fulfill the intent of P.L. 96-479. This ongoing research monitor would log and forward to appropriate policymakers the development breakthroughs occurring and to occur in composites technology. In this way annual or even more frequent policy adjustments could keep pace with materials accomplishments.

If SPI can provide further information or assistance on this subject, we will be pleased to cooperate.

Sincerely yours,

Joseph S. McDermott
Manager, Reinforced
Plastics/Composites
Institute

JSMcd/ck

encl.

Mr. SHAMANSKY. Mr. Lubin, I want to thank you for your testimony. We are indeed honored to have the father of the reinforced plastics and advanced composite materials here. We are greatly honored.

I do want to say that I personally appreciate your comments on the excessive restrictions on the distribution of information. There are a number of us who respectfully disagree with the idea that we can stay ahead by not exchanging information among ourselves. We stay ahead by doing that. We don't get behind by doing that.

Mr. LUBIN. That is right.

Mr. SHAMANSKY. The surest way, it seems to me, to get behind is to adopt the way that the Soviets have approached this kind of a thing.

Mr. LUBIN. That is right, too.

Mr. SHAMANSKY. I think that it is very self-defeating. I am very grateful for your testimony. I hope you will remain for questions. We will have Dr. Mueller testify next.

Mr. LUBIN. Of course. I appreciate your comments.

Mr. SHAMANSKY. Thank you, sir.

STATEMENT OF DR. JAMES I. MUELLER, PRESIDENT, THE AMERICAN CERAMIC SOCIETY

Dr. MUELLER. Thank you, Mr. Chairman. Somewhat analogous to your query of Mr. Lubin a moment ago, I am not related to the macaroni Muellers. [Laughter.]

Mr. SHAMANSKY. Thank you, Dr. Mueller.

Dr. MUELLER. Mr. Chairman, members of the subcommittee, I am James I. Mueller, professor of ceramic engineering at the University of Washington, and currently president of the American Ceramic Society. I appreciate your invitation to appear today to assist in your understanding of what I consider a very substantial, yet often overlooked, member of the materials community, namely, ceramics.

The American Ceramic Society, with its affiliate, the National Institute of Ceramic Engineers, has a total membership and subscribers to its publications of about 10,000 profession engineers and scientists who research, development, manufacture, market, and manage for the ceramic and related industries. Yet most people hearing the term "ceramics" consider only objects used and made by artists and hobbyists.

Properly understood, ceramics should be considered an engineering material, one that is basic to a large segment to our American industry. Ceramic materials, by their most widely accepted definition, are inorganic nonmetallic materials which require a high temperature, somewhat above 1,200 degrees Fahrenheit in their processing or use. The ceramic industry, although not identified per se in Government agency reports, adds a total value by manufacturing of close to $50 billion per year.

I have listed in my handout material a list of certain types of the industry and the products that they manufacture. I will not take the time to review that at this time; however, I would like to point out that in the recently published Fortune 500, 4 of the first 10 manufacture ceramic products; 8 of the first 30; 10 of the first 50; and 110 in the total of 500.

It is interesting to note that two of our most advanced technology products—fiber optics for long distance telephone transmission and the Space Shuttle tiles—are both made in a similar manner from the same type of material, an ultra high pure silica, 99.7 percent silicon dioxide.

With that brief introduction, I would like to turn to three issues within our industry which might be addressed in a meaningful national materials policy. I would also like to thank Mr. Andrews and Dr. Lubin for some introductory remarks to these comments. Dr. Lubin was referring to fiberglass as a composite material. Of course, he is very well aware that the material in there is a ceramic material—the reinforcing material—as is the carbon graphite material.

Numerous meetings have been held during the past year to develop imputs for the required response to Public Law 96-479, the National Materials and Minerals Policy Act of 1980. A number of discussions have been heard and read regarding the importance of conserving, stockpiling, or substituting for our strategic metals. Concern has also been expressed that aluminum might also have been included in this list. There is no doubt that continued consideration should be given to these metals and their source minerals. However, I feel, with some apprehension, that one very important aspect of the production of these materials has not been given proper, if any, attention.

I believe it has been assumed that the refractory materials required for the processing of strategic metals can be considered an as "off-the-shelf" item. I suggest that refractory products, in all categories, should be considered as a critical material not only from the standpoint of their need in the processing of strategic metals but also based upon our dependence on imported raw materials in many cases plus the increasing competition for what in the past have been considered "bountiful" raw materials.

The refractory industry, for example, would have considerable competition for bauxite, a source of alumina. They would come obviously from the aluminum metal industry, but competition also would come from the requirements for paper, abrasives, and electronics. The United States, I might add, is also heavily dependent upon foreign imports for other refractory materials such as chromite, zircon, and graphite.

Although the refractory industry is a low-profile industry, it is still very important to the national defense and to our economy. As such, it must compete with more well-defined industries not only for the same strategic raw materials, but also for the energy required to manufacture its product. There are substitutes, and the national materials policy should address this fact.

Several areas exist in which multinational interests are centered for the development of advanced ceramic materials, but this discussion this morning will relate primarily to those ceramics under consideration for advanced heat engines, principally, the gas turbine. The United States, West Germany, and Japan are the leading contenders.

If we look at the Bureau of Census statistics published in 1977, we notice that the value added by the manufacture of the internal combustion and turbine engines was about $5 billion. I believe it is

safe to assume that one-tenth of that total might involve ceramic components currently under consideration and development, this could amount to as much as $500 million per year.

Approximately in 1971, DARPA established its program on brittle material design oriented primarily toward the development of a ceramic gas turbine engine. Approximately $142 million has been allocated to this and subsequent programs as shown in table 1 appended. Of this, only 19 percent, of $28 million, was dedicated to materials and process development.

Comparatively, the West German Ministry for Research and Technology initiated a program in 1974, and during the period of 1974 to 1983, they have appropriated $48 million, of which 56 percent was allocated for materials development. These are comparable dollars, but I would like to underline the percentage differential.

Two related programs are in process in Japan: The so-called Moonlight project initiated in 1978 for a 7-year duration, and the presently established Ministry of International Trade and Industry program for the development of advanced material production. Fifty-five percent of the total allocated for advanced turbine engines, or $26 million, has been planned for materials development and process development. The ceramic component of the MITI program amounts of $10 million over the period of 7 years. Again, the participants of this endeavor are shown in table 3 attached.

The MITI program has preliminary funding of $450 million over a 10-year period. Fine or high performance ceramics are a very important segment of this, and the projected funding is estimated at $60 million. The concept of this program, incidentally, is to have organizations which have a laboratory-developed material which meets the prescribed specification. These funds will then be used to upgrade the production facilities to make them available on the public market.

The United States is currently utilizing only four domestic raw materials suppliers. There are six companies involved in the processing of these materials. Several other companies which have the technical and financial capability have not yet committed their funds for this. I might add that foreign components manufactured from these ceramic materials could assist our entrance into the gas turbine field.

When you compare these to the materials producers and processors in West Germany and Japan who, with the encouragement and assistance from their governments, have been making substantial technological strides over the past few years—I refer in my handout to an observation that I was able to make a year ago last November when we observed Daimler-Benz who have a commitment, incidentally, to have a ceramic gas turbine engine in their automobiles by the 1990's, having a simulated engine spin test program in which they were using what they claimed was a past-generation material, operating at several hundred degrees Centigrade above the best that we had been able to do at that time, and at RPM speeds which were in excess of 10 to 20 percent of the best that we have done in this country.

Our electronics industry is also heavily dependent on ceramic products. One area in which the U.S. ceramics industry is lagging

behind international competition is in ceramic packaging for increasingly sophisticated semiconductor devices. A San Diego-based subsidiary of Kyoto Ceramics, a Japanese-based company, presently accounts for about 75 percent of the $500 million in sales in this area alone. This percengage, I might add, may increase during the current year as several of the U.S. manufacturers are considering divesting themselves of their production lines.

The Japanese high performance ceramics industry with assistance from MITI and both industry and government, recognizing the future importance of these materials, has made far-reaching advances in recent years. I am again referring to these electronic ceramic packaging materials. An article in the February 2, 1982 issue of Japan Times reported that Nikko Research Center forecasted an increase in sales of fine or high performance ceramics from $625 million in 1980 and $870 million in 1981 to $3.14 billion in 1985.

I might add that at this point a few remarks about substitution might be in order. There are a number of ceramic materials that can be used in substitution technology for critical materials. These would include coatings to cut down on metal corrosion such as aluminides and silicides that could be used on low-chromium refractory materials. Hydrolyzation of organometallics and their subsequent polymerization would give us a very energy-efficient metal coating. Chemical vapor deposition, in its advanced stages of development, allows the deposition of oxides, nitrides, and silicides for high-temperature protection.

Mr. Lubin has also already discussed the composites, and I submit that many of the composites that he was referring to are low-temperature composites, but there is a future for high-temperature composite capabilities, as well. These would include both glass carbine and alumina fibers, silicon nitride, silicon carbide fibers, either in monofilament, fabric, or felt. Again, in this latter case, the Japanese are several years ahead of our development at this stage.

Ceramic matrix composites are in their early stages, and United Technology has done a very fine job in recent years in coming up with something that may be near production capabilities.

We have already discussed monolithic ceramics. I would like to add one other factor which I think is very important, and I am sure that Dr. Lubin will agree to this with me. That is the matter of design. Most of our designers today are used to designing with metals. As one of our faculty members said, "In design with metals, metals are forgiving of a designer's errors. A composite material or a brittle ceramic material is not."

We find that there may be some prejudicial bias in this area, and one of the reasons for this is the lack of understanding by many structural designers of the inherent properties in composites and brittle materials. We feel there is a need to improve design methodology. There is a need for understanding and communication between the designer and materials individual. Substitution requires true understanding of the material properties plus the ability and willingness to develop and use truly interdisciplinary communications.

I might add one other thing, and that is that resubstitution might be considered. This is something that I have not heard addressed in any of the discussions on the materials policy. For instance, we have a great deal of our stainless steel which is being used in home and commercial kitchens. We could go back to vitrious china or porcelain enamel for these areas. Glass and porcelain enamel could be resubstituted for stainless cooking material. Glass could be returned to the area of cooking. I also point out that we have no substitutions at the present time for the use of zircon and zirconium silicates for glass refractories. We have no substitution at the present time for the import of titanium or zirconium that are to be used in our dielectrics or for aluminum oxides for abrasives, refractories, or their forementioned electronics. Also, we do have some need for chromium oxide in refractories.

Regarding information transfer, during my last visit to Japan in May 1981, I was privileged to visit numerous industrial, Government, and university research laboratories. My hosts were very gracious, open, and frank in their discussions on their recent developments in fine ceramics. Several of their companies have established product lines which are currently being marketed worldwide. Although they admit that some of these products will be greatly improved within months or years, as new generation laboratory materials are turned over to production, they are acquiring production experience and development of their marketing capabilities.

Chairman Shamansky, if I may give you a brief demonstration, I have here a product which I was able to buy in the Tokyo equivalent of Radio Shack last May. This is manufactured by Kyoto Ceramics under the trade name Son of Sun. They already have the best trade name for this. This happens to be a photovoltaic solar cell. This particular one cell will operate this small radio. A cell four times this size will operate a 9-inch diagonal portable TV set. We have one about window size, roughly 2½ feet by 4 feet, that will generate about 100 watts. I would like, if I may, to give you a demonstration.

Of course, the sunlight in this room is not sufficient. What I need is a bright spot.

Well, gentlemen, I am sorry. The electronic industry doesn't work too well, but I guarantee you that if we had a bright light on this you would hear a local radio station.

I use this as an example to point out that the United States developed this particular silicon production method. We felt that we needed something with about 10 percent efficiency rather than 5 percent efficiency. The Japanese have picked up and used the 5-percent production material to develop their own production and marketing capabilities.

Added to that is a rather interesting statement in a brochure by Asahi Glass Co. describing their research and development division. I quote: "Our R. & D. efforts are directed toward acquiring a dominant status for our company among industrial enterprises of the world in the 21st century." They are obviously looking past next quarter's dividend.

Contrary to popular concept, most engineers and scientists from both West Germany and Japan are willing to discuss and to ex-

change views on their latest developments. All can learn from open discussions, and this should be encouraged and sustained. No one today is a technological island, although sometimes our inability to communicate in other languages puts us at a severe disadvantage.

I should like to ask you to refer to table 4 which is another factor which must be considered. What is the number of engineers entering the profession each year? In table 4, you notice the number of degrees which are being offered in engineering in Japan and West Germany. What you will note there is the fact that we have the smallest percentage of total baccalaureate degrees in 1980 in engineering. Even more significant is the fact of the total number of engineers per capita in the United States compared to those in West Germany and Japan. I allude to the fact that a technical manpower situation is also a very necessary aspect of a national materials policy.

There is one other very obvious factor that must be considered in this evaluation. In both West Germany and Japan, industry and Government are cooperating to achieve their goals, whereas we are carrying a handicap due to lack of understanding and cooperation between Government and industry. United States industry will have to play its role by looking beyond the immediate as to its [and our national] future and by developing a closer cooperation with Government and academia in a manner in which all will gain without jeopardizing industrial proprietary rights.

Of prime significance, however, is the lack of appreciation by many in Government of the significance of materials development for the future health of the Nation's high-technology industries. This is of special importance in the development of advanced ceramic materials for those applications when standard design and production methods do not always hold.

We held a meeting in our State several years ago in cooperation with the Army Mechanics and Materials Research Center on high-technology ceramics. The question came, "How long does it take from inception to production?" Dr. Morris Berg from AC Sparkplug indicated that the aluminum oxide sparkplug required a total of 20 years between the concept of that and actually putting them into the automobile.

I should also like to point out that the concept of the Space Shuttle tile came to Lockheed in the midsixties. We are now in the first generation of that. The second generation of those tiles will be on the third vehicle, and we will see an entirely different type of material involved. That is again a 20-year period.

These three examples have been brought to your attention in the hope that this low-profile but highly important industry may be identified in any consideration of national materials policy. Stockpiling could be of only limited relief to a small portion of our industry. The research and development proposed in H.R. 4281 can have a profound impact if, and only if, those having responsibility will recognize the industrial importance of these materials and their producers. The ceramic community can, with appropriate support, make major contributions through research, development, and production to substitution technology and products. The industry can favorably compete in the international marketplace given what the President referred to in his April 5 report to Congress as a "busi-

ness and political climate which encourages private sector R. & D.," and if that same climate is provided to the processing and the manufacturing areas.

If we have the necessary engineering and scientific manpower, if we have the "proper climate" for research, and if we have sustaining support for manufacturing and processing technology, then the ceramic community can add substantially to our overall materials industry.

I would like to call these the three "m's," the requirement for manpower, money, and management.

In closing, I would like to quote Dr. Walter C. Williams who is NASA's chief engineer:

> From an engineering standpoint, we've progressed to where we can do just about anything we please. What we choose to do—that's beyond the ken of an engineer. That's society's wishes. And we can be a bold society or we can be a timid society. But if we choose to be a bold society, we can do bold things.

I thank you very much.

[The prepared statement of Dr. Mueller follows:]

STATEMENT OF
JAMES I. MUELLER

before the
Subcommittee on Science, Research and Technology
and the
Subcommittee on Transportation, Aviation and Materials

April 22, 1982

Chairman Walgren, Chairman Glickman, members of the Subcommittees, I am James I. Mueller, Professor of Ceramic Engineering at the University of Washington and President of The American Ceramic Society. I appreciate your invitation to appear today to assist in your understanding of a very substantial, yet often overlooked, member of the materials community -- namely ceramics.

The American Ceramic Society, with its affiliate the National Institute of Ceramic Engineers, has a total membership and subscribers to its publications of approximately 10,000 professionals who research, develop, manufacture, market and manage for the ceramic and related industries. Yet most people hearing the term "ceramics" consider only objects used by artists and hobbyists.

Properly understood, ceramics should be considered an engineering material -- one that is basic to a large segment of American industry. Ceramic materials, by the most widely accepted definition, are inorganic non-metallics which require a high temperature, above 1200°F, in their processing or use. The ceramic industry, although not identified per se in government agency reports, adds a total value by manufacturing of close to $50 billion each year. The following is a list of a few of the ceramic applications in basic industries:

Industry	Ceramic Products
Construction	brick, cement, plaster, window glass, tile, sanitary ware, fiberglas insulation

Automotive	spark plugs, catalytic converters, window glass, turbo-chargers
Food Processing	glass containers
Electronics	capacitors, integrated circuit substrates, resistors, magnetics
Manufacturing	abrasives, grinding wheels, cutting tools
Power	electrical insulators, nuclear fuel
Consumer Products	dinnerware, appliances, dentifrices, denture teeth
Metals	refractories, high temperature insulation

It is interesting to note that two of our most advanced technology products -- fiber optics for long distance transmission, and the space shuttle tiles -- are both made in a similar manner from the same type material, ultra high purity (99.7%) silicon dioxide, or silica (SiO_2).

With that brief introduction, I turn to three issues within our industry which might be addressed in a meaningful national materials policy.

I. REFRACTORIES AS A STRATEGIC MATERIAL

Numerous meetings have been held during the past year to develop inputs for the required response to PL96-479, the National Materials and Minerals Policy Act of 1980. Substantial discussions have been heard and read regarding the importance of conserving, stock piling or substituting for our strategic metals -- chromium, cobalt, manganese, molybdenum and nickel. Concern has been expressed that aluminum also should be included in this list. There is no doubt that continued consideration should be given to these metals and their source

minerals but I feel, with some apprehension, that one very important aspect of the production of these materials has not been given proper -- if any -- attention.

It has been assumed that the refractory materials required for processing the strategic metals can be considered as "off the shelf" items. I suggest that refractory products, in all categories, should be considered as critical materials -- not only from the standpoint of their need in the processing of strategic metals but also based upon our dependence on imported raw materials in many cases, plus the increasing competition for what in the past have been considered "bountiful" raw materials. The refractory industry, for example, would have considerable competition for bauxite, a source of alumina. This would come obviously from the aluminum metal industry but competition also would come from the requirements for paper, abrasives, and electronics. The United States also is heavily dependent upon foreign imports for other refractory materials such as chromite, zircon and graphite.

Although the refractory industry is a low profile industry, it is still very important to the national defense and the economy. As such it must compete with more well-defined industries for not only the same strategic raw materials but also the energy required to manufacture its product. There are no substitutes, and the national materials policy should address this fact.

II. ADVANCED CERAMICS FOR HEAT ENGINES

Several areas exist in which multinational interests are centered for the development of advanced ceramic materials, but this discussion will relate principally to those ceramics under consideration for advanced heat engines.

primarily the gas turbine. The United States, West Germany, and Japan are the leading contenders in this "race" for industrial supremacy.

The value added by the manufacture of the internal combustion and turbine engines in 1977 was about $5 billion. If we assume that one-tenth of that total might involve ceramic components currently under consideration and development, this could amount to as much as $500 million.

In 1971, the Defense Advanced Research Projects Agency (DARPA) established its program on Brittle Material Design, oriented toward the development of a ceramic gas turbine engine. Approximately $142 million was allocated to this and subsequent programs, as shown in Table I, for the period 1974 to 1983. Of this, about $28 million -- or 19% -- was dedicated to material and process development.

The West German Ministry for Research and Technology (BMFT) initiated a program in 1974 for Ceramic Components for Vehicular Gas Turbines. The total government funding, which is matched by industry but not by universities and institutions, for the period 1974-83 was nearly $48 million, of which 56% was allocated for materials development as shown in Table II.

Based upon information currently available, it is difficult to identify that portion of the Japanese government funding specific to ceramic gas turbine engine development. Two related programs are in progress -- the "Moonlight Project," initiated in 1978 for a seven year duration, and the recently established MITI program for the development of advanced material production, including fine or high technology ceramics. One of the Moonlight Project's five program areas includes Advanced Gas Turbines for power generator (100 MW). Fifty-five percent of the total, or $26 million, has been planned for material and

process development. The gas turbine program was funded at about $100 million and included work on both metals and ceramics plus turbine component technology and pilot/prototype development. The ceramic component of this totaled $10 million over the seven years. The participants in the ceramic endeavor are shown in Table III.

The MITI program, referred to as the Industrial Base Technology Program, has preliminary funding plans of $450 million over ten years and includes materials as one of its three principal thrusts. Fine or high performance ceramics are an important segment of this and the projected funding is estimated at about $60 million. The concept is to establish certain minimum material specifications or performance objectives which a participating company must have met through R&D laboratory development.

The U.S. is currently utilising four domestic raw materials suppliers, one of whom has indicated it does not plan to devote further company funds to the development and/or improvement of materials to be utilized in this area. There are six companies involved in the processing of these materials, including the aforementioned organization. Several other companies, which have the technical and financial capability to enter the field, have expressed interest but have not yet committed. Of course, foreign components could assist our entrant.

This compares to those materials producers and processors in West Germany and Japan who, with encouragement and assistance from their governments, have been making substantial technological strides over the past few years. A little over a year ago, several of us from the U.S. attended a meeting in West Germany after which we visited the Daimler-Benz plant in Stuttgart.

We were given the opportunity to observe a test being performed on a bladed turbine wheel made from hot pressed silicon nitride, which was termed a "past generation material." This unit was being spin-tested in an engine simulator which included a combustor, stator and heat exchanger, all fabricated from ceramic materials. We were informed that the test had begun six hours earlier and that the temperature was cycling between 1300°C and 1350°C with the rotational speed varying between 43,000 to 50,000 rpm. During the specific period of our visit, the temperature was 1340°C with a speed of 49,000 rpm.

III. CERAMICS IN ELECTRONICS

Our electronics industry is also heavily dependent on ceramic products, and one area in which the U.S. ceramics industry is lagging behind international competition is in ceramic packaging for increasingly sophisticated semiconductor devices. Although several domestic companies produce these, a San Diego-based subsidiary of Kyoto Ceramics, Inc. accounts for about 75% of the $500 million in sales last year. This percentage may increase during the current year if one or more of the U.S. manufacturers divest themselves of their production lines.

The Japanese high performance ceramics industry, with assistance from MITI and both industry and government recognizing the future importance of these materials, has made far-reaching advances in recent years. An article in the February 2, 1982, issue of "Japan Times" reported that Nikko Research Center forecasted an increase in sales of fine or high performance ceramics from $625 million in 1980 and $807 million in 1981 to $3.14 billion in 1985.

During my visit to Japan in May, 1981, I was privileged to visit numerous industrial, government and university research laboratories. My hosts were very

gracious, open and frank in discussing their recent developments in fine ceramics. Their manpower effort and work ethic are resulting in extremely rapid progress in the development of materials and processes. Several of their companies have established product lines which are currently being marketed world-wide. Although they admit that some of these products will be greatly improved within months or years as the new generation laboratory materials are turned over to production, they are acquiring production experience and developing their marketing capabilities. Even more significant is their corporate attitudes toward the future -- twenty to thirty years from now. It is probably best summarized in a brochure by Asahi Glass Company, Ltd., describing their Research and Development Division which states, "Our R&D efforts are directed towards acquiring a dominant status for our company among industrial enterprises of the world in the 21st century." They obviously are looking past next quarter's dividend!

Contrary to a popular concept, most engineers and scientists from both West Germany and Japan are willing to discuss and to exchange views on their latest developments. All can learn from open discussions, and this should be encouraged and sustained. No one today is a technological island, although our inability to communicate in their languages puts us at a severe disadvantage.

Another consideration is the number of engineers entering the profession each year. Table IV shows the number of engineering baccalaureate degrees in 1980 compared to the total population and clearly indicates the importance which the other countries place upon technology.

There is one other, very obvious factor that must be considered in this evaluation. In both West Germany and Japan, industry and government are

cooperating to achieve their goals, whereas we are carrying a handicap due to lack of understanding and cooperation between government and industry. U.S. industry will have to play its role by looking beyond the immediate as to its (and our national) future and by developing a closer cooperation with government and academia in a manner in which all will gain without jeopardizing industrial proprietary rights. This is a narrow lane to travel but one which can be traveled with mutual respect and confidence.

Of prime significance, however, is the lack of appreciation by many in government of the significance of materials development for the future health of the nation's high technology industries. This is of special importance in the development of advanced ceramic materials for those applications when standard design and production methods do not always apply. As stated earlier there is a tendency, no a practice, to expend our resources on ancillary efforts when the major requirement is the development of a satisfactory material.

Three examples have been brought to your attention in the hope that this low-profile but highly important industry may be identified in any consideration of national materials policy. Stockpiling could be of only limited relief to a small portion of our industry. The research and development proposed in H.R.4281 can have a profound impact if, and only if, those having responsibility will recognize the industrial importance of these materials and their producers. The ceramic community can, with appropriate support, make major contributions through research, development and production to substitution technology and products. Its industry can favorably compete in international marketplaces given what the President refers to in his April 5 report to Congress as "a business and political climate which encourages private sector R&D" and if that same climate is provided

to the processing and manufacturing areas.

If we have the necessary engineering and scientific manpower, if we have the "proper climate" for research, and if we have sustaining support for manufacturing and processing technology, then the ceramic community can add substantially to our overall materials industry.

To quote Dr. Walter C. Williams, chief engineer of NASA, "from an engineering standpoint, we've progressed to where we can do just about anything we please. What we choose to do -- that's beyond the ken of the engineer. That's society's wishes. And we can be a bold society or we can be a timid society. But if we choose to be a bold society we can do bold things."

TABLE I

FUNDING OF PROGRAM FOR U.S. CERAMIC
GAS TURBINE ENGINE RESEARCH AND DEVELOPMENT

Initiation Date	Organization	Sponsor	Funding ($Million)	Duration (years)
1971	Ford	DARPA	20	8
1976	Garrett	DARPA	12	5
1979	Westinghouse/ Garrett	DOE	1.9	1
1978	Garrett	USAF	2.5	3
1978	DDA	DOE (CATE)	43	-
1978	Solar	Army	.35	-
1979	Garrett/Ford	DOE(AGT)	53	-
1980	DDA/Pontiac	DOE(AGT)	60	-
1980	Garrett/Williams	DOE(AGT)	65	-
1981				

TABLE II

BMFT PROGRAM FUNDING LEVLES FOR CERAMIC COMPONENTS

FOR VEHICULAR GAS TURBINES

Activity	Participants	Funding($Million)	Percent
Gas Turbine Industry	Daimler-Benz; Stuttgart NTU; Munich Volkswagen; Wolfsburg	21.1	44
Silicon Nitride Producers	Annawerk, Rodenthal Degussa; Hanau Feldmuhl; Plochingen Rosenthal; Selb H. G. Stark, Goslar	15.2	32
Silicon Carbide Producers	Annawerk Electroschmelzwerk; Kempten Rosenthal Sigri; Meitingen H. G. Stark	11.1	23
Institutes & Universities	Technical University Berlin Technical University Clausthal-Zetterfeld Institute for Materials Research, DFVLR University of Erlangen Technical University Karlsrahe Max Plank Institute, Stuttgart	.5	1
	TOTAL	47.9	100

TABLE III

"MOONLIGHT" PROJECT PARTICIPANTS

Ceramic Manufacturers	
Kyoto	Silicon Carbide Combuster & Shrouds
Toshiba	Turbine Rotor & Stator Blades
NGK	Heat Shield
Asahi Glass	Evaluation of Thermal Fatigue
Turbine Manufacturers	
Ishikawajima (heavy industrial)	Design Technology
Kawasaki (heavy industrial)	
Mitsubishi (heavy industrial)	
- - - - - - - - - - - - - - - -	
Cent. Res. Inst. Elect. Power Indus.	
Government Industrial Technology Research Institutes	
Nagoya	Joint work with private companies through Engineering Research Association (14 companies)
Osaka	
Kyushu	

Table IV

BACCALAUREATE DEGREES GRANTED

IN LEADING WESTERN INDUSTRIAL NATIONS

	BACCALAUREATE DEGREES		PER CENT	POPULATION	ENGINEERING DEGREES PER CAPITA
	TOTAL	ENGINEERING	ENGINEERING	(1)	(2)
Federal Republic of Germany	60,436	22,400	37.1	0.65	3.45
Japan	315,122	65,422	20.7	1.11	5.89
United States	949,000	54,600	5.8	2.27	2.41

(1) Hundred Millions

(2) Degrees Per Hundred Thousand Population

Mr. SHAMANSKY. Thank you, Dr. Mueller, and thank you, Mr. Lubin. I have some questions; however, I first have to make a comment. When I saw that you were a ceramic engineer, I immediately thought of Ohio State, and then I saw that you were a graduate of Ohio State.

Dr. MUELLER. Yes, sir.

Mr. SHAMANSKY. Since I am also a graduate of Ohio State, I had to make some mention of that.

In your last remarks, I must point out that based on the hearings that this committee has had, it seems that we as a country are following the policy of eating the seed corn. The guaranteed graduate student loans are being wiped out, and all the way through. Ohio State would lose if the administration's proposals for aid-to-education go through. These various core programs would lose help for thousands of students. It is beyond my comprehension as to what they think they are doing.

Dr. MUELLER. Well, Mr. Shamansky, there are some other problems related to that, and this is another subject.

Mr. SHAMANSKY. You brought it up, and I am glad.

Dr. MUELLER. Yes, sir.

Mr. SHAMANSKY. I think it is relevant to what we are talking about.

Dr. MUELLER. Let me give you an example of our own institution. We, in the State of Washington like many other States, are undergoing severe financial stresses at the present time. Budgets need to be balanced, et cetera. Our State legislature just deemed that our graduate tuition will increase about 60 percent. To accommodate that, and to make graduate schools somewhat desirable, it is necessary for us to increase our stipends for graduate students on research contracts at least to cover that increase. This means that a $15,000 contract to support one graduate student next year will cost $22,000 because after you increase his salary as you increase the benefits and increase the indirect costs, everything goes up.

With support on contractual research, much of which comes from the Government, this means now that we will be able to take those resources to support fewer students.

As you say, sir, we are eating the seed corn.

Mr. SHAMANSKY. I have commented recently that when I went to Ohio State in Columbus, my first quarter's tuition was $25. The dollar bought more, but not that much more.

Dr. MUELLER. That is about 1 day now, sir.

Mr. SHAMANSKY. Yes, right. I would like to mention to both of you and ask you to comment on this: based on research done by Battelle, which as you know has its world headquarters in Columbus, in a study that they were making on the best utilization of American energy, they then reexamined the premise about what an automobile should be like. They have concluded that using current technology that we could build within 3 to 5 years an automobile that would get 80 to 85 miles per gallon with a gasoline engine, 100 to 105 with a diesel engine. It would carry four passengers with their luggage, go in and out of the interstate system, and would have the mean life of 100,000 miles. They say this is possible.

Now, the various things that they assume they would be using would be flywheels. I know that the Japanese are working on ce-

ramic engines to burn up the pollution instead of putting it out in the air. They would lessen the weight. It would have a steel skeleton, but everything on the outside or anyplace else would be a much lighter material.

I would like to ask Dr. Lubin if he believes—do you believe, sir, that the composite industry is prepared now with its technology to substitute composites for the various heavy pieces of metal that we have now and that we have to burn up energy to move?

Mr. LUBIN. Yes, sir. Industry is definitely prepared. There is quite a lot of work going on. This Ford engine that I mentioned is probably one of the best things that has come out recently. We are all anxiously waiting to see what kind of gas consumption they will come up with, but they say that between 40 and 50 is quite possible with the present technology and using a marriage of ceramics and composites I think that we can definitely go to higher mileage figures. There is just no question about it. I would say give it 5 years and you will have it.

Right now, the main reluctance is material cost.

Mr. SHAMANSKY. The material cost.

Mr. LUBIN. Right. Graphite is too expensive. It is around $30 to $100 a pound. As soon as more graphite starts to be used, the price will drop down to maybe $20 or less, and it will be used more and more in automotive applications.

What has really held it up is the slowdown in the price of gas. We were expecting the gas price to go way up, and it stabilized and went way down. Therefore, all of a sudden, the research has slowed down.

Mr. SHAMANSKY. But as a National policy, this Government cannot go on that basis——

Mr. LUBIN. Right.

Mr. SHAMANSKY [continuing]. Because if the Persian Gulf is cut off for any reason, there it goes.

Mr. LUBIN. That is right.

Mr. SHAMANSKY. There is a very narrow margin that this so-called glut represents.

Mr. LUBIN. I have been in direct contact with primarily the Chevrolet and Ford research people. The research in the laboratories has progressed to such an extent that if they are given the green light they can do it in 2 years.

Mr. SHAMANSKY. Given the green light by whom? Why can't the companies give the green light themselves? Why do they have to wait for somebody else to give them the green light?

Mr. LUBIN. Public acceptance.

Mr. SHAMANSKY. Well, how can you accept something if they don't develop it?

Mr. LUBIN. That is true. I have no answer to that.

Mr. SHAMANSKY. It simply amazes me. You heard the earlier testimony. What are these people waiting for?

Mr. LUBIN. Graphite springs have been available for quite a few years. Why are they waiting for it? I can show you the figures of weight savings. In my mind, there is no excuse for not using graphite now for springs. Now, the driveshaft is another excellent application. They are so fatigue resistant that they will last forever.

Mr. SHAMANSKY. I referred originally to this bill based on Batelle's research.

Mr. LUBIN. Yes.

Mr. SHAMANSKY. I entered a bill in the House of Representatives and Senator Stevens, the majority whip, did so in the Senate, to provide for a competition to get beyond the automobile companies themselves, not that they are excluded, but to say, "If you achieve the criteria, build the prototype that meets these criteria, then we will test market 10,000." However, we can't seem—a panel of this committee was in Detroit last July——

Mr. LUBIN. Yes.

Mr. SHAMANSKY [continuing]. And the American automobile companies just said, "Oh, we don't know how to do that." Now, you know, I just don't believe them because the Germans and the Japanese are clearly going to do it.

Mr. LUBIN. They are doing it now.

Mr. SHAMANSKY. And the American companies say that it cannot be done.

Mr. LUBIN. Yes. Another thing that is holding them back is that they are financially in a bad way now. The research funds have been cut by quite a lot.

Mr. SHAMANSKY. Yes. They ought to examine how they got behind in the first place.

Mr. LUBIN. True, of course. We all know why.

Mr. SHAMANSKY. They never examine themselves. Right?

Mr. LUBIN. That is right. But there is still some research, and my friends in the automotive industry tell me that is the case. They had a lot of projects going on just exactly in this direction. However, the bulk of the money has been cut and stopped.

Mr. SHAMANSKY. Dr. Mueller, would you care to comment on the possibility in terms of time and everthing else in terms of developing a new ceramic engine? In information from Dr. Harold Malgrim is that they are working on—the Japanese are working on a ceramic engine. I alluded to that a little earlier.

Dr. MUELLER. We are, too, sir. We are in this country, as well.

Mr. SHAMANSKY. All right. How far away would you estimate the development of such an engine to be?

Dr. MUELLER. I am not familiar with the situation in Japan, per se. Toyoto, Nissin and a few others are in this area. I do not have any information on that.

Mr. SHAMANSKY. What about ourselves?

Dr. MUELLER. In West Germany, as I indicated, Daimler-Benz has a commitment to have a ceramic engine in their Mercedes and hopefully in production by the mid-1990's.

We have had, in this country, since 1971, the DARPA program which I referred to on broom trail design. Ford Motor Co. was the prime contractor. Alluding to your comment earlier, the whole purpose at that time was to generate a high-temperature engine to get rid of emissions.

Mr. SHAMANSKY. Right.

Dr. MUELLER. In 1973, the high-performance and also the fuel savings became also important. They have demonstrated the feasibility of this. The Detroit Diesel Alison Division of General Motors Co. is working on the application of ceramics into a truck engine.

Garrett Engine Co. in Phoenix is doing similar work. All of these programs have been substantially cut back in the last year or two.

I was talking to the head of the ceramic group at Ford Motor Co., and he told me just several months ago—in November, to be exact—that he queried his management as to what the situation would be should DOE cut the funding of that engine. His management said, "We will have to disband your group." I don't think that would happen in Japan or West Germany. I think there would be some way in which that could continue.

In direct answer to your question, I would guess that the United States, at the present rate, would not have a turbine engine in a commercial or a domestic automobile before the year 1995 or the year 2000.

Cummins Engine Co. has been working very substantially——

Mr. SHAMANSKY. Are we behind the Germans and the Japanese in that?

Dr. MUELLER [continuing]. Very much so.

Mr. SHAMANSKY. Yes.

Dr. MUELLER. Very much so.

Mr. SHAMANSKY. And is there any consciousness on the part of the American companies that they have their own future at stake here, or is it just a matter that the feds didn't give them the money?

Dr. MUELLER. I think they are very conscious of this, Mr. Shamansky. Again, it is a very high-risk situation. Can I put it into my own words a little differently?

Mr. SHAMANSKY. Surely.

Dr. MUELLER. I don't think we have the attitude in the automotive industry today that the Boeing Airplane Co. had in the early 1950's when they decided to invest $16 million in the development of a commercial jet transport. We don't have that commitment today.

Mr. SHAMANSKY. Why not?

Dr. MUELLER. Well, I think that I mentioned that one of the reasons is—and you must remember that I am an academician. I am not a financier or a management type.

Mr. SHAMANSKY. Maybe their problem is that they are management types.

Dr. MUELLER. That could be. Yes, sir. However, I think that the thing is that back in those days Bill Allen who was the president of Boeing Airplane Co. was looking 20 and 30 and 40 years ahead. I don't think they are doing that today. I think that we are looking at next quarter's or next year's dividends. I don't think that the Japanese or the Germans are that short-sighted. They are looking a decade or two decades ahead.

That reference that I gave to the Asahi Glass R. & D. says it specifically.

Mr. SHAMANSKY. I just think that you are absolutely right. Regretfully do I say that.

Mr. Lubin brought to our attention an article in "Automotive News," March 22, 1982, headline, "Ford Break in the Molded Tri-Plastic engines." We hope that is a hopeful sign.

I would like to ask you, Dr. Mueller, that since there are no substitutes for such refractory materials such as chromite, zircon, and

graphite, what strategies would you propose the Federal Government to follow and what is the U.S. vulnerability to these materials? I am going to add also, does everything depend on the Government playing a role, or cannot these industries themselves see where they are going?

Dr. MUELLER. Mr. Shamansky, let me refer to this.

Mr. SHAMANSKY. Yes.

Dr. MUELLER. We do have zircon mineral capabilities in this country. Unfortunately, they are located in areas in which environmental protection is of far greater importance today than the extraction of the mineral. I use the Florida beach sands as an example.

Mr. SHAMANSKY. The Florida beach sands?

Dr. MUELLER. The Florida beach sands. The heavy sands there, the heavy sands at the mouth of the Columbia River do have the capability of producing these things. We do not want to do that to our beaches. The Australians and some of the others are willing to do so. However, we do have the mineral capability here, but right now we are dependent on other areas.

I think the same thing would hold for the carbon area. Mr Lubin mentioned a moment ago the importance of the graphite reinforcement material. How much of that graphite reinforcement material is coming from this country, and how much is being imported from abroad?

Mr. LUBIN. All of it until now.

Mr. SHAMANSKY. All of it from abroad?

Mr. LUBIN. Yes. Actually, the precursors, the raw materials, come from Japan. That was the only source until recently.

Mr. SHAMANSKY. Why?

Mr. LUBIN. They were very reluctant to set up plants to make it here. The cost of such installations is very high.

Mr. SHAMANSKY. But if the future—isn't there going to be a future industry there?

Mr. LUBIN. That is right. They are talking about it and making plans.

Dr. MUELLER. In fairness, Union Carbide is in the process of developing a plant in this country.

Mr. SHAMANSKY. That seems to be incomprehensible. If it is going to grow in the way, based on your testimony, that it has to be growing, why then don't you talk about your colleagues as to the reluctance of these companies to invest in their own futures?

Mr. Lubin, you are the man with the composites and the graphites. Where are your colleagues?

Mr. LUBIN. By the way, I was just informed that Union Carbide and Celanese are starting production of graphite in USA.

Mr. SHAMANSKY. Yes. Dr. Mueller just mentioned that. However, that is one company in the whole country.

Mr. LUBIN. There are two companies.

Mr. SHAMANSKY. Two companies. OK.

Mr. LUBIN. Graphite, until now, was a novelty. All of a sudden, they realize that it is a——

Mr. SHAMANSKY. But how is it that the Japanese distinguished it from a novelty and thought it was a real product?

Mr. LUBIN. Why is it that the Japanese do everything better than we do? I have no answer to that. I am sorry.

Mr. SHAMANSKY. I don't either. I have a morbid fascination about this whole topic.

Dr. MUELLER. I have a suggestion to that, Mr. Shamansky.

Mr. SHAMANSKY. Yes.

Dr. MUELLER. One is this forward-looking concept that I mentioned a little earlier. Secondly, they put engineering manpower and technical manpower on a project a factor of 5 to 20 times of what we do. You visit a—in the plants that I visited last spring a year ago, where we have one or two ceramic engineers or ceramic scientists working, they have 10 to 20.

Mr. SHAMANSKY. Yes. I don't mind saying, Dr. Mueller, that your table 4 is—I have been talking about this in general terms. I think this is a very succinct way of putting forth the problem. We in our committees have been trying to suggest to the administration that the country is going to face a crisis soon. The dimensions, it seems to me, are set forth right here. Japan is half our population and turns out on a per capita basis twice as many engineers. Russia produces 300,000 bachelors of science.

Dr. MUELLER. May I add one other thing, sir?

Mr. SHAMANSKY. Yes.

Dr. MUELLER. That is that the equipment in the Japanese universities and the equipment in the West Germany universities which I have visited is 20 years ahead of the equipment which we are using in our country to educate our engineers.

Mr. SHAMANSKY. I would like to tell you that I took a tour of Ohio State's physics and chemistry laboratories recently. I graduated from Ohio State 35 years ago, and I went to my chemistry lab, and I felt right at home. Nothing had changed, including the smell.

Dr. MUELLER. Did you have Professor Evans, too, Mr. Shamansky?

Mr. SHAMANSKY. No, I don't think so. There are estimates of from $50 to $85 million to re-equip those laboratories. I want you to know, and I want the record to show, that this committee has had to fight this administration to get money for science education and reequipment. I think there is no defense whatsoever for such an approach by the administration except that they are blindly cutting without any regard to consequences in the future.

If you think that the automobile business is not looking to the future, I suggest you should look at this administration. I am very partisan when I say that only because those are the facts. It is not partisanship. Those are the facts. We are not reequipping our universities. Almost half of our Ph. D. candidates in science and engineering are from overseas. We are knocking out graduate student loans—guaranteed student loans.

Dr. MUELLER. There is another reason for that, Mr. Shamansky, and that is, at least in the engineering field, in the materials area that I am acquainted with, over the past 3 or 4 years due to a rather profound shortage of engineering and technology graduates, salary offers have been stupendous. A lot of youngsters today are interested in getting out and getting the big bucks. They don't want to take the time to go on to graduate school.

Mr. SHAMANSKY. I understand that, but a National policy we cannot let the market——

Dr. MUELLER. Yes, sir.

Mr. SHAMANSKY [continuing]. Govern that essential feature of that policy. Now, that is how a National policy should operate. As things now stand there is a blind, almost mystical reliance on the so-called market. It reaches eventually, I would say, almost insanity when you ignore the consequences.

Dr. MUELLER. I might also point out that there is a large number of faculty members in our universities in all areas, not only science and engineering, who were World War II veterans like I am, and we are rapidly approaching that retirement point. There is not much back there in the young area to fill us up.

Mr. LUBIN. You know, there is an interesting approach. The Russian Government feels that educating engineers is a National policy of great benefit to the state.

Mr. SHAMANSKY. Yes.

Mr. LUBIN. It is a government policy.

Mr. SHAMANSKY. Yes. We had the 300,000 figure that the committee has that they turn out annually.

Mr. LUBIN. Yes.

Mr. SHAMANSKY. And I might, you know, look down my nose and say, "Well, they are not as good as ours," but there is not that much difference. You have got those numbers and the quality is not that different, especially if their equipment is up to date and things of that sort.

Mr. LUBIN. Yes; I would like to mention that in one institute they have 200 stress analysts, in one place, just in Rega.

Mr. SHAMANSKY. Well, Dr. Lubin, you mentioned the corporate members of your society. What message are you bringing to this country and to your members themselves?

I am going to switch now. Instead of berating the administration, I want to berate—I am good at that—I figure that I am paid to do this——

Mr. LUBIN. Yes.

Mr. SHAMANSKY [continuing]. I am going to point the finger back at your own members and say that I don't hear the outcry from them. I don't see them allocating—you know, they can deduct up to 5 percent of their—I think it is their profits where they can make charitable contributions. They are nowhere near approaching that to insure their own survival in the future.

Mr. LUBIN. Well, I can tell you that the SPI is extremely active in education. They sponsor courses in several colleges. They encourage students taking plastics courses.

Mr. SHAMANSKY. Yes, but are you satisfied with the efforts given to the need?

Mr. LUBIN. I think they are doing quite a lot. I haven't been in touch with it for a year, but I was impressed with some of the reports about the sponsoring of colleges, the sponsoring of courses. They see that this is a necessity. We have a tremendous shortage of plastics engineers because this is not a recognized profession. Particularly, SPI is doing as much as they can about it.

Mr. SHAMANSKY. How about the American Ceramics Society and its members?

Dr. MUELLER. Well, the American Ceramics Society's headquarters are in Columbus, Ohio.

Mr. SHAMANSKY. Yes; I thought that it was. I am delighted that you mentioned that.

Dr. MUELLER. I think that there is a great deal more being done by industry in the past few years in the support of education.

Mr. SHAMANSKY. Are you satisfied? More is how far from enough?

Dr. MUELLER. Oh, a long way from enough.

Mr. SHAMANSKY. OK; but——

Dr. MUELLER. However, more is better than zip.

Mr. SHAMANSKY. Yes.

Dr. MUELLER. There is a large effort going on in many universities in the establishment of affiliate programs where industrial organizations become affiliated in financial support with various departments or programs within our universities.

In our ceramic industry, we have gone through a rather substantial change in the last 20 years. The ceramic industry at one time was a large group of family-owned, homeowned private companies. A lot of those companies now have been bought out or merged with giant conglomerates. In looking through that Fortune 500 and seeing Exxon and consider that a ceramic company—at least one with a subsidiary that manufactures ceramic products—is little different. I don't guess that we have the interest or the attention of the corporate people in Exxon as though we would do in a corporate ceramic company whose management were all ceramic engineers and graduates, for instance.

We also have the situation where many of the top management chief executive officers and their immediate assistants today are not engineering graduates. They are graduates of business school.

Mr. SHAMANSKY. They are not even manufacturing graduates.

Dr. MUELLER. That is correct.

Mr. SHAMANSKY. All they are are finance—the MBA type.

Dr. MUELLER. They are the MBA type. Yes, sir.

Mr. SHAMANSKY. And their bonuses are tied to this year's profit.

Dr. MUELLER. Yes, sir.

Mr. SHAMANSKY. The net profit. Right?

Dr. MUELLER. Yes, sir, Laureant's book, "On a Clear Day You Can See General Motors," described it very, very well. That should be good reading for many, many members of this committee.

Mr. SHAMANSKY. The instrumentation costs alone are estimated at $2 to $4 billion for the next 5 years. Is it reasonable to expect industry to make up for that, assuming that the Federal Government doesn't do anything about it?

Dr. MUELLER. I think that it would be interesting to have some kind of a matching thing where the Government would match whatever industry would put forth on some percentage basis.

Mr. SHAMANSKY. I don't mind telling you that I look forward to the testimony of Mr. Edward David, president of Exxon research, who will testify next week on hearings on manpower because I think that what we are beginning to conclude is that these companies cannot just sit back. The people are not coming along. That is all.

Dr. MUELLER. Sure.

Mr. SHAMANSKY. They are not going to be there unless these American companies realize that they have a stake in making sure that the students are graduating and going on to train the next generation.

Dr. MUELLER. Because manpower is a very critical material.

Mr. SHAMANSKY. We have had testimony that the actual work period for an engineer—productive work period—is maybe 10 to 15 years by which time he then—not that he is not working, but he is going on to other things rather than direct attention to the engineering problem. We are not replacing our engineers.

Dr. MUELLER. I think that we have another thing, too, which is that many of our—at least in my own program at the University of Washington, I would say that 50, 60, or 70 percent of each graduating class wants to get into management within 5 years.

Mr. SHAMANSKY. Well, that is the point that I was trying to make.

Dr. MUELLER. Yes.

Mr. LUBIN. May I add one point? I have been connected with Grumman Aerospace for many years, and they have a policy of training engineers for their needs. They have quite a program. First, they have numerous scholarships for sons and daughters of Grummanites, and then an equal number of scholarships for non-Grummanites. They are constantly playing it up, and there is a lot of publicity on it. Also, they spend as much as they can for the development of new plastics and materials especially in the plastics industry because they are one of the few companies to realize what potential there is in the plastics industry.

Mr. SHAMANSKY. Yes. Well, your company has a branch subsidiary in Delaware, Ohio——

Mr. LUBIN. That is right.

Mr. SHAMANSKY [continuing]. which has had a problem with materials.

Dr. LUBIN. Exactly.

Mr. SHAMANSKY. We have had a problem with the stress on a special Y-shaped piece that has cost them maybe $60 million or more to replace. They have acted very responsibly——

Mr. LUBIN. That is right.

Mr. SHAMANSKY [continuing]. But they have suffered.

Mr. LUBIN. Yes; they decided that this was their reputation and they were going to solve it or else.

Mr. SHAMANSKY. Yes.

Gentlemen, I want to thank you on behalf of the committee. I found your testimony absolutely fascinating. I will do everything that I can to pass the information along. I think that it is important that you have given the testimony that you have here today. I look forward to meeting you again.

Thank you very much. The hearing is adjourned.

[Whereupon, at 11:44 a.m., the subcommittees recessed to reconvene at the call of the Chair.]

APPENDIX

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OFFICE OF THE UNDER SECRETARY OF DEFENSE

WASHINGTON, D.C. 20301

RESEARCH AND
ENGINEERING

13 MAY 1982

Dr. Paul C. Maxwell
Science Consultant
Committee on Science and Technology
Suite 2321 Rayburn House Office Building
Washington, D.C. 20515

Dear Dr. Maxwell:

We appreciated the privilege of appearing in behalf of the Department of Defense (DoD) at the April 20, 1982 hearing on critical materials. Attached are our answers to your questions for insert in the formal record of the proceeding.

Thank you for the opportunity to provide the DoD views on this important matter. If we can be of further assistance, please do not hesitate to call.

Sincerely,

RICHARD E. DONNELLY
Director, Industrial Resources

Enclosure
As Stated

Answers to Dr. Maxwell's Questions

Question 1 - What R&D programs for substitution are being considered by DoD? How much money is required? For how long?

Answer: At the present time the DoD has a relatively modest program precisely directed at the development of substitutes for strategic and critical materials. In fiscal year 1982, we have identified about $13 M being spent by the Military Departments which is directed at substitutes. About the same amount is being expended in areas such as conservation, reclamation, life extension, and processing. Each of these address different facets of the strategic and critical materials problems confronting the Department of Defense. About the same level of expenditures for these programs has been proposed for fiscal year 1983. Moreover, a major portion of the ongoing military performance oriented materials and structures R&D program has been planned to strongly consider the displacement or the substitution option while still fulfilling our mission needs. For example our vast composites program (organic, metal, and carbon matrix composites) which will develop substitutes for several critical and strategic materials, is funded at a level of about $80 M in FY 1982. The represents about 1/3 of the total DoD materials and structures program. Furthermore, a substantial portion of the DoD Rapid Solidification Technology (RST) program, which is funded at a level of about $24 M in FY 1982 will be developing superalloys and other materials which will use lower fractions of strategic elements and display appreciable performance benefits. Overall, about 30 percent of our total materials and structures research and development program will be developing new materials which could, in an emergency situation, be used to displace or substitute for critical and strategic materials.

It is difficult at this time to quantify the funding or time required to totally fulfill our needs because of the fluidity of the situation. We have, however, initiated further studies at the Institute for Defense Analyses and at the Department of Defense Metal-Matrix Composite Information Analysis Center to assist us in further quantification of military requirements for R&D in the aforementioned areas.

Question 2 - Is there current sufficient coordination for materials policy among the various agencies and departments? Isn't better coordination possible at the level of the Executive Office of the President?

Answer: It is our belief that coordination of materials policy through the mechanism of the Cabinet Council on Natural Resources and Environment is entirely adequate. Furthermore, the coordination of government-wide materials R&D through the Committee on Materials (COMAT) of the Federal Council on Science, Engineering and Technology has proved to be quite effective in the past and should continue to do so. Elevating the coordination function to the Executive Office of the President appears to be an unwarranted escalation under the present circumstances.

Question 3 - One of the basic problems of stockpiling in the past has been the market disruptions due to inventory purchases or sales. How will similar disruptions be avoided with the proposed $12 billion in purchases and sales?

Answer: GSA is the government organization responsible for purchases and disposals from the national defense stockpile; market disruption avoidance is the direct responsibility of GSA. Therefore, DoD defers to GSA on this issue.

Question 4 - What is meant by "potentially significant but undeveloped resources" of cobalt, platinum or nickel as stated in the program plan (page 32)? What percentage of annual production do each of these resources represent? For how many years? At what comparative market cost?

Answer: The Department of the Interior (Bureau of Mines) is the government organization responsible for assessing domestic resources for materials such as cobalt, platinum and nickel. Although we understand the statement addresses cost and current market potential of domestic resources, we defer to Interior for resource and market assessment.

Question 5 - The Report notes that the Administration is "initiating a major interdepartmental effort to improve the Nation's preparedness for national mobilization" (page 22). Could you elaborate upon the nature of this effort, and what departments and agencies are involved? How will this differ from past studies? How will this effort differ from the work of the National Commission on Supplies and Shortages, undertaken in 1976? In what way does this comprehensive approach represent "the most concerted high-level effort in the past twenty-five years" (page 22)?

Answer: The effort described is the responsibility of the Presidentially established Emergency Mobilization Preparedness Board chaired by the Assistant to the President for National Security Affairs. The principal objective is an improved national capability to respond to major peacetime and wartime emergencies. Membership consists of deputy secretary or under secretary level representative from the Departments of State, Treasury, Defense, Justice, Interior, Agriculture, Commerce, Labor, Health and Human Services, HUD, Transportation, Energy and Education, plus OMB, CIA, NSC, OPD, JCS, OSTP, FEMA, OPM, and the Deputy Counsellor to the President. This effort is undertaken with the top priority of the President formally bringing together all agencies for a concerted effort to improve national preparedness. It is not a study; it is a policy and plan of action effort.

[illegible]

COMMITTEE ON SCIENCE AND TECHNOLOGY
U.S. HOUSE OF REPRESENTATIVES
[illegible]
WASHINGTON, D.C. 20515
(202) 225-6371

[illegible]

April 22, 1982

Dr. John M. Marcum
Assistant to the Director
for Energy and Natural Resources
Office of Science and Technology Policy
Washington, D.C. 20500

Dear Dr. Marcum:

Thank you for appearing as a witness at the April 20, 1982 hearing on critical materials. Your contribution should be helpful to the Committee's continuing activities in this important area. As was noted by Chairman Glickman a number of additional questions would be submitted for insertion in the formal record of the proceedings. Attached is a list of questions which we require answered by May 15, 1982.

Your efforts in this matter are sincerely appreciated.

Sincerely,

Paul C. Maxwell
Science Consultant

PCM/mr

Attachment

1. P.L. 96-479 calls for close coordination between industry and the government in developing a means for data collection and analysis. How will this be carried out? What is the role of OSTP? (see page 16)

2. Page 16 of the President's statement refers to "long-term, high risk technology" (emphasis added). What about materials science and other related basic materials research questions?

3. What Federal regulatory policies discourage private materials research (page 16)? Examples?

4. How will international materials R&D information exchange programs be established as suggested? Why the focus on Europe rather than other developed (Canada and Japan) or developing countries (Mexico, Brazil and South Africa)?

5. How is the International Development Cooperation Agency going to give new emphasis to strategic minerals? Examples?

6. On page 17: "policy resolution of materials research and development questions will be provided through the Cabinet Council". What is the role of COMAT? OSTP? Who has ultimate responsibility?

7. The Report notes that a "formal mechanism" will be established within COMAT "for information exchange between agency materials research and development program managers" (page 17). Could you elaborate further upon what formal mechanisms are being envisioned and how they will operate?

8. In the Report the Administration "reaffirms the Committee on Materials (COMAT) . . . for the coordination of Federal materials and minerals research and development activities" and directs Assistant Secretary-level representation from those departments and agencies concerned with minerals and materials (page 17). How does this differ from current practice? Does this mean that attendance of Assistant-Secretaries will be mandatory, or may they send qualified representatives? What activities are currently being pursued by COMAT? What new activities are envisioned for the immediate future? How will these activities be aided by attendance at the Assistant-Secretary level?

9. The Report notes that a "formal mechanism" will be established within COMAT "for information exchange between agency materials research and development program managers" (page 17). Could you elaborate further upon what formal mechanisms are being envisioned and how they will operate?

10. The President's report (Appendix A) states "existing standards may be based on inadequate scientific data" with respect to air quality standards; it also questions "scientific evidence" regarding asbestos and lead standards. What specifically is being done to provide more adequate data? What scientific evidence is being questioned regarding asbestos and lead?

EXECUTIVE OFFICE OF THE PRESIDENT
OFFICE OF SCIENCE AND TECHNOLOGY POLICY
WASHINGTON, D.C. 20500

July 15, 1982

Dr. Paul C. Maxwell
Science Consultant
Committee on Science and Technology
U.S. House of Representatives
Suite 2321
Rayburn House Office Building
Washington, D.C. 20515

Dear Dr. Maxwell:

As Executive Secretary of the Committee on Materials (COMAT), John Marcum asked me to respond to your letter of April 22, 1982.

Answers to the questions in your letter on the critical materials hearing held April 20th are enclosed.

Sincerely,

MURRAY SCHWARTZ
Executive Secretary
Committee on Materials

Office of Science and Technology Policy

Questions and Answers
for the April 20, 1982
Hearing on Critical Materials

1. Q: P.L. 96-479 calls for close coordination between industry and the government in developing a means for data collection and analysis. How will this be carried out? What is the role of OSTP? (see page 16)

   A: OSTP does not have a direct role. Both Interior and Commerce have this responsibility in their respective areas. The referenced section of the Program Plan refers to R&D and not data collection and analysis.

2. Q: Page 16 of the President's statement refers to "long-term, high risk technology" (emphasis added). What about materials science and other related basic materials research questions?

   A: Support of basic research for materials science and technology is part of the Government's role and coordination of basic research is an OSTP role, as assigned by the Program Plan.

3. Q: What Federal regulatory policies discourage private materials research (page 16)? Examples?

   A: Federal regulatory policies in the environmental area have caused industry to spend a disproportionate amount of their R&D funds to solve these problems at the expense of R&D to improve productivity, in the minerals industry in particular.

4. Q: How will international materials R&D information exchange programs be established as suggested? Why the focus on Europe rather than other developed (Canada and Japan) or developing countries (Mexico, Brazil and South Africa)?

   A: This will be done through COMAT and the State Department. The focus will not be only on Europe but, as stated in the President's Report, "with the European Communities and other free world countries."

5. Q: How is the International Development Cooperation Agency going to give new emphasis to strategic minerals? Examples?

   A: Part of IDCA's mission is to ensure that developing nations goals are taken fully into account in executive branch decisionmaking on trade and technology. With IDCA giving new emphasis to strategic minerals, this should have a positive effect on the U.S. strategic mineral supply. Questions regarding specific examples should be directed to the IDCA.

6. Q: On page 17: "policy resolution of materials research and development questions will be provided through the Cabinet Council." What is the role of COMAT? OSTP? Who has ultimate responsibility?

   A: COMAT plays a coordinating role among the agencies concerned with minerals and materials research, identifying key points of emphasis, as well as problems, related to technology and availability needs, and coordinates the development of long-range plans for an effective R&D program to meet clearly defined national needs. OSTP, using COMAT, is responsible for establishing science and technology policies to guide the agency programs. OSTP is responsible for policymaking while the agencies are responsible for their respective programs. When necessary, policy resolution of materials R&D issues will be provided through the Cabinet Council on Natural Resources and the Environment.

7. Q: The report notes that a "formal mechanism" will be established within COMAT "for information exchange between agency materials research and development program managers" (page 17). Could you elaborate further upon what formal mechanisms are being envisioned and how they will operate?

   A: An inventory of federal minerals and materials R&D is being prepared to provide a data base for this purpose. A working group within COMAT has been formed to collect data for this inventory. When an adequate data base has been developed, additional working groups will be formed for program coordination.

8. Q: In the Report the Administration "reaffirms the Committee on Materials (COMAT) . . . for the coordination of Federal materials and minerals research and development activities" and directs Assistant Secretary-level representation from those departments and agencies concerned with minerals and materials (page 17). How does this differ from current practice? Does this mean that attendance of Assistant-Secretaries will be mandatory, or may they send qualified representatives? What activities are currently being pursued by COMAT? What new activities are envisioned for the immediate future? How will these activities be aided by attendance at the Assistant-Secretary level?

   A: The reaffirmation of COMAT is the Administration's start of formal coordination of minerals and materials R&D activities in the Executive Branch and follows the direction of the President's National Materials and Minerals Program Plan. Attendance of Assistant-Secretaries at COMAT meetings will not be mandatory and they may send qualified representatives. The first priority of COMAT is the preparation of an inventory or data base of all federal R&D for minerals and materials. This data base will be used for assessing the federal program and developing long-range R&D plans. Assistant-Secretarial level representatives will ensure that COMAT activities receive high-level attention within the concerned agencies.

9. Q: The President's report (Appendix A) states "existing standards may be based on inadequate scientific data" with respect to air quality standards; it also questions "scientific evidence" regarding asbestos and lead standards. What specifically is being done to provide more adequate data? What scientific evidence is being questioned regarding asbestos and lead?

   A: Appendix A of the Program Plan refers to Department of Labor reviews of lead standards focusing on more cost effective approaches to abatement, and a review of the scientific evidence supporting asbestos standards. Specific questions on the status of these reviews should be directed to the Department of Labor (OSHA).

[boilerplate committee roster]

COMMITTEE ON SCIENCE AND TECHNOLOGY
U.S. HOUSE OF REPRESENTATIVES
[illegible] RAYBURN HOUSE OFFICE BUILDING
WASHINGTON, D.C. 20515
(202) 225-6371

[boilerplate committee roster]

April 22, 1982

Mr. Robert Wilson
Office of Strategic Materials
U. S. Department of Commerce
Main Commerce Building
Washington, D. C. 20230

Dear Mr. [illegible]son:

Thank you for appearing as a witness at the April 20, 1982 hearing on critical materials. Your contribution should be helpful to the Committee's continuing activities in this important area. As was noted by Chairman Glickman a number of additional questions would be submitted for insertion in the formal record of the proceedings. Attached is a list of questions which we require answered by May 15, 1982.

Your efforts in this matter are sincerely appreciated.

Sincerely,

Paul C. Maxwell
Science Consultant

PCM/mr

Attachment

1. A major objective of the new Office of Strategic Materials is to reduce U.S. vulnerability to potential supply disruptions of critical materials from foreign nations. How does the role of this new Office fit into the concept of Cabinet Council decision-making?

2. What is the next area of "specific materials needs case" as required by law to be studies? How was the subject determined? What will be the role of the Cabinet Council?

3. What specific steps is DOC taking regarding follow-up to the case study of the aerospace industry just completed?

4. Regarding materials such as chromium, cobalt and titanium the DOC aerospace study indicated that continued R/D "should reduce the criticality of problems in the supply of these materials to the aerospace industry after 1990". Isn't this a bit optimistic? What is the basis of the assessment? Who is performing the R&D?

5. Why is DOC not recommending use to Title III authorities under the Defense Production Act for critical materials domestic production? Is the assumption of no "hot" war before the end of the century totally realistic?

6. The Administration's response to the 1980 Act is essentially a minerals policy statement. What has the Administration done to assess Federal policies that adversely or positively affect all stages of the materials cycle? Who is doing the continuing, long-range analysis of materials used to meet national security and economic requirements as required by section 5(a)(1)(B) of the Act? What role is the Department of Commerce playing in this analysis?

UNITED STATES DEPARTMENT OF COMMERCE
The Assistant Secretary for Economic Affairs
Washington, D.C. 20230

May 18, 1982

Dr. Paul C. Maxwell
Science Consultant
Committee on Science and Technology
U.S. House of Representatives
Washington, D.C. 20515

Dear Paul:

I was happy to appear as a witness at the House Committee on Science and Technology hearings on critical materials on April 20, 1982. Enclosed are responses to the Committee's questions which you asked for.

I would be happy to discuss these questions and answers with you further. I look forward to work with you more closely on these important critical materials issues.

Sincerely,

Robert Dale Wilson
Director
Office of Strategic Resources

Enclosure

ANSWERS TO QUESTIONS - HOUSE COMMITTEE ON SCIENCE AND TECHNOLOGY

HEARINGS ON CRITICAL MATERIALS - April 20, 1982

DEPARTMENT OF COMMERCE, OFFICE OF STRATEGIC RESOURCES

1. A major objective of the new Office of Strategic Resources is to reduce U.S. vulnerability to potential supply disruptions of critical materials from foreign nations. How does the role of this new Office fit into the concept of Cabinet Council decision-making?

The Department of Commerce is a member of the Cabinet Council on Natural Resources and the Environment and will participate at the highest level of decision-making on strategic materials issues. The Office of Strategic Resources (OSR) coordinates the minerals and materials activities of the Department of Commerce, including data collection and analysis, materials research and development, mobilization and stockpile planning, and seabed mining functions. OSR represents the Department on the Strategic Materials Policy Working Group of the Cabinet Council. This Working Group prepares analyses and develops policy options for decision by the Cabinet Council Officers. The Office of Strategic Resources will work to assure critical materials supplies to the nation's industries through its coordinating role within the Department of Commerce and its participation on the Cabinet Council Working Group.

2. What is the next area of "specific materials needs case" as required by law to be studied? How was the subject determined? What will be the role of the Cabinet Council?

The National Materials and Minerals Policy, Research and Development Act of 1980 (P.L. 96-479) required the Department of Commerce to do a materials needs case study and to thereafter assess additional cases as necessary. The first case study of the "Critical Materials Requirements of the U.S. Aerospace Industry" was officially transmitted to Congress in April 1982. The Department of Commerce will conduct a second case study of the "Critical Materials Requirements of the U.S. Steel Industry." The steel industry was selected because of its importance to industrial production and national security, its large consumption of strategic materials and concern about the reliability of material supplies, and the related technical opportunities for materials substitution and conservation. The departments and agencies represented on the Cabinet Council on Natural Resources and the Environment will contribute data and information to the study, review drafts of the analyses, and use the information and recommendations developed by the study in overall policy formulation.

3. What specific steps is DOC taking regarding the follow-up to the case study of the aerospace study just completed?

The DOC study of "Critical Materials Requirements of the U.S. Aerospace Industry" provided information and analysis used in the development of the National Materials and Minerals Program Plan submitted by the Administration under the National Materials and Minerals Policy, Research and Development Act of 1980. Its specific recommendations regarding research and development, stockpile planning, public lands, trade policy, regulatory reform, etc. will continue to be considered as the Administration implements the Program Plan. The study also provided the basis for the program plan of the DOC Office of Strategic Resources, which includes the development of an industry materials needs data base, an extended industry consultation program, participation in the review of the quality of the strategic stockpile, increased input into the regulatory reform program, and a more effective research and development program on critical materials substitution and conservation. The study format and methodology will be used for the additional materials needs case studies to be assessed by the Department of Commerce.

4. Regarding materials such as chromium, cobalt and titanium the DOC aerospace study indicated that continued R&D "should reduce the criticality of problems in the supply of these materials to the aerospace industry after 1990." Isn't this a bit optimistic? What is the basis of the assessment? Who is performing the R&D?

The aerospace study found that improved substitution, conservation, and recycling techniques would reduce the risk of shortages in aerospace strategic materials needs in the medium to long-term. Aerospace requirements for titanium and tantalum, which are in relatively secure supply, may increase depending on whether new uses are found in aerospace products. The analysis shows that the requirements for imports of chromium and cobalt could be decreased by 20%-80% if research and development is continued and substitution and conservation measures are implemented. These projections were based on technical estimates by experts of critical materials savings resulting from various rates of changes in technology. The Administration's economic recovery program contains specific tax incentives to research and development by the private sector. The 25% credit for incremental R&D expenditures, the tax credits for research contracted to universities and non-profit organizations, and the changes in accounting for domestic and foreign research expenditures should spur increased industry R&D activity. In addition, the Government will continue its own substantial materials research program focusing on national priority programs and primarily long-term, high-risk projects. The technological programs of both industry and Government should play a major role in meeting problems of materials supply, but of course must be supplemented by stockpiling for defense needs and actions to improve the competitiveness of our domestic materials producers.

5. Why is DOC not recommending use of Title III authorities under the Defense Production Act for critical materials domestic production? Is the assumption of no "hot" war before the end of the century totally realistic?

The use of Title III of the Defense Production Act of 1950 to provide incentives to domestic minerals and materials production was not included among the many recommendationns of the study of "Critical Materials Requirements of the U.S. Aerospace Industry." The recommendations were only those measures needed to assure supplies of cobalt, chromium, titanium, and tantalum to the aerospace industry and were based on the demand projections done for the study. These projections were of aerospace materials requirements in a peacetime rather than a mobilization or "hot war" scenario. Projections of mobilization demand for materials for all sectors of the economy are done by the Federal Emergency Management Agency in estimating goals for the national defense stockpile, which is our primary means of assuring materials supplies in a wartime or emergency situation. Title III provisions are valuable instruments for increasing the production of materials from domestic sources but were not recommended as essential at this time based on the aerospace study analysis. However, Title III authorities should continue to be assessed in relation to other programs as a means of meeting national security needs. Under the National Materials and Minerals Program Plan, the Cabinet Council will seek to determine whether circumstances exist under which the use of Defense Production Act incentives would be more cost-effective for defense needs than stockpile purchases.

6. The Administration's response to the 1980 Act is essentially a minerals policy statement. What has the Administration done to assess Federal policies that adversely or positively affect all stages of the materials cycle? Who is doing the continuing, long-range analysis of materials used to meet national security and economic requirements by section 5(a)(1)(B) of the Act? What role is the Department of Commerce playing in this analysis?

The National Materials and Minerals Program Plan developed by the Administration under the 1980 Act addresses problems and opportunities in materials supply at all stages of the materials cycle. The public lands, stockpile, and trade measures are primarily aimed at increasing the reliability of minerals or raw materials supply. The regulatory reform and tax measures should help stimulate investment in the domestic materials processing and manufacturing industries. Substitution, conservation, and recycling of minerals and materials should be improved through the incentives to private research and development and more effective Government materials research programs. The analysis and development of policy recommendations for providing for the nation's long-range materials needs will continue within the overall policy framework of the Program Plan. The Cabinet Council on Natural Resources and the Environment will be the coordinating body for Government analyses and policy formulation. The Department of Commerce will continue to be a major participant in this process through its membership on the Cabinet Council, its conduct of basic industry analyses such as the aerospace and steel studies, and its contribution to technical forums such as the Committee on Materials which will analyze materials R&D needs and directions.

97-007 O - 82 - 18

[boilerplate committee roster]

COMMITTEE ON SCIENCE AND TECHNOLOGY
U.S. HOUSE OF REPRESENTATIVES
SUITE 2321 RAYBURN HOUSE OFFICE BUILDING
WASHINGTON, D.C. 20515
(202) 225-6371

[boilerplate staff roster]

April 22, 1982

Honorable William P. Pendley
Assistant Secretary for Energy
and Minerals
Department of Interior
Washington, D. C. 20240

Dear Mr. Pendley:

Thank you for appearing as a witness at the April 20, 1982 hearing on critical materials. Your contribution should be helpful to the Committee's continuing activities in this important area. As was noted by Chairman Glickman a number of additional questions would be submitted for insertion in the formal record of the proceedings. Attached is a list of questions which we require answered by May 15, 1982.

Your efforts in this matter are sincerely appreciated.

Sincerely,

Paul C. Maxwell
Science Consultant

PCM/mr

Attachment

1. What is a strategic and critical materials impact statement? Who makes the determination and how as to what is a critical and what is a strategic material?

2. How effective has the existing minerals attache program been? Are current deficiencies in the program primarily a result of inadequate expertise and training, or rather lack of adequate staffing and manpower?

3. The Report states that the Administration will seek increased and improved cooperation from the private sector in responding to minerals and materials data requests (page 20). What specific steps are being planned to achieve the increased and improved cooperation? Will this effort be entirely voluntary, or are mandatory requirements being considered? Will additional legislative authorities be required to carry out this program?

4. The Administration proposes the possibility of creating a National Minerals Information Center. Where within the Federal Government would this Information Center be located? To what agency or department would it primarily be responsible? What powers would it have? What would be its relationship with other departments and agencies having minerals and materials data responsibilities?

5. According to the policy statement, minerals research is now being focused more on supply assurance, i.e., the development of domestic sub-economic deposits, and major process innovations. What implications might this have for other aspects of the policy, i.e., the use of Title III DPA, and stockpile purchases? Who is doing the analysis of the use of Title III DPA, and when will it be complete?

United States Department of the Interior

OFFICE OF THE SECRETARY
WASHINGTON, D.C. 20240

May 14, 1982

Mr. Paul C. Maxwell
Science Consultant
Committee on Science and Technology
House of Representatives
Washington, D.C. 20515

Dear Paul:

In response to your request dated April 22, 1982, we have attached the answers to the questions posed by the Committee.

Sincerely,

William P. Pendley
Deputy Assistant Secretary
Energy and Minerals

Attachment

Question 1: What is a strategic and critical materials impact statement? Who makes the determination and how as to what is a critical and what is a strategic material?

Answer: The impact analysis will describe presently known mineral deposits in the area, the probabilities and possibilities of utilization of economic and submarginal deposits, and the probabilities and possibilities of discovery of presently unknown deposits, based on geologic knowledge and inference, so that the possible mineral contribution of an area under review can be properly considered in relation to the national security and economic needs of the nation. There is no distinction between "strategic" and "critical" materials. Section 12 of the Strategic and Critical Materials Stock Piling Act of 1979 (50 USC 98 et seq.) defines strategic and critical materials as follows: "(1) The term 'strategic and critical materials' means materials that (A) would be needed to supply the military, industrial, and essential civilian needs of the United States during a national emergency, and (B) are not found or produced in the United States in sufficient quantities to meet such need. (2) The term 'national emergency' means a general declaration of emergency with respect to the national defense made by the President or by the Congress." The President is charged with determining which materials are "strategic and critical" and by Executive Order 12155 of September 10, 1979, the President delegated this responsibility to the Director of the Federal Emergency Management Agency. Ninety-three materials are currently designated as "strategic and critical" under the Stock Piling Act, and eighty of these are mineral materials. The attached table lists the ninety-three together with stockpile goals and inventories. In addition, the Defense Production Act Amendments of 1980 (Public Law 96-294) designated "energy" as a "strategic and critical material."

Table FEMA's STOCKPILE GOALS, (DESIRED INVENTORY MIX), AND INVENTORIES
AS OF SEPTEMBER 30, 1981

	Goal		Inventory
Aluminum Metal Group	7,150,000 ST Al		3,444,064
(Alumina)	0		0
(Aluminum)	700,000 ST		1,733
(Bauxite, Metal Grade, Jamaica Type)	21,000,000 LGT		8,858,681
(Bauxite, Metal Grade, Surinam Type)	6,100,000 LGT		5,299,596
Aluminum Oxide, Abrasive Grain Group	638,000 ST Abrasive Grain		259,124
(Aluminum Oxide, Abrasive Grain)	0 ST		50,904
(Aluminum Oxide, Fused, Crude)	0 ST		249,867
(Bauxite, Abrasive Grade)	1,000,000 LCT		0
Antimony	38,000 ST		40,730
Asbestos, Amosite	17,000 ST		42,514
Asbestos, Chrysotile	3,000 ST		9,958
Bauxite, Refractory	1,600,000 LCT		176,589
Beryllium Metal Group	1,220 ST Be Metal		1,061
(Beryl Ore 11% BeO)	18,000 ST		17,987
(Beryllium Copper Master Alloy)	7,900 ST		7,387
(Beryllium Metal)	400 ST		229
Bismuth	2,200,000 LB		2,081,298
Cadmium	11,700,000 LB		6,328,809
Castor Oil (Sebacic Acid)	22,000,000 LB		12,524,243
Chromium, Chemical & Metallurgical Group	1,353,000 ST Cr Metal		1,324,921
(Chromite, Chemical Grade Ore)	675,000 SDT		242,614
(Chromite, Metallurgical Grade Ore)	3,200,000 SDT		2,468,043
(Chromium, Ferro, High Carbon)	185,000 ST		402,696
(Chromium, Ferro, Low Carbon)	75,000 ST		318,692
(Chromium, Ferro, Silicon)	90,000 ST		58,355
(Chromium, Metal)	20,000 ST		3,763
Chromite, Refractory Grade Ore	850,000 SDT		391,614
Cobalt	85,400,000 LB Co		40,802,393
Columbium Group	4,850,000 LB Cb Metal		2,510,528
(Columbium Carbide Powder)	100,000 LB Cb		21,372
(Columbium Concentrates)	5,600,000 LB Cb		1,780,463
(Columbium, Ferro)	0 LB Cb		930,911
(Columbium, Metal)	0 LB Cb		46,051
Copper	1,000,100 ST		29,048
Cordage Fibers, Abaca	155,000,000 LB		0
Cordage Fibers, Sisal	60,000,000 LB		0
Diamond, Industrial Group	29,700,000 CT		41,939,184
(Diamond Dies, Small)	60,000 PC		25,673
(Diamond, Industrial, Crushing Bort)	22,000,000 CT		23,692,782
(Diamond, Industrial, Stones)	7,700,000 CT		18,233,666
Feathers & Down	1,500,000 LB		0
Fluorspar, Acid Grade	1,400,000 SDT		895,981
Fluorspar, Metallurgical Grade	1,700,000 SDT		611,738
Graphite, Natural - Ceylon, Amorphous Lump	6,100 ST		5,499
Graphite, Natural - Malagasy, Crystalline	20,000 ST		17,904
Graphite, Natural - Other than Ceylon & Malagasy	2,800 ST		2,804
Iodine	5,800,000 LB		8,013,074
Jewel Bearings	120,000,000 PC		69,908,736
Lead	1,100,000 ST		601,036
Manganese Dioxide, Battery Grade Group	67,000 SDT		222,136
(Manganese, Battery Grade, Natural Ore)	62,000 SDT		219,125
(Manganese, Battery Grade, Synthetic Dioxide)	25,000 SDT		3,011
Manganese, Chemical & Metallurgical Group	1,500,000 ST Mn Metal		1,970,715
(Manganese Ore, Chemical Grade)	170,000 SDT		221,044
(Manganese Ore, Metallurgical Grade)	2,700,000 SDT		3,170,065
(Manganese, Ferro, High Carbon)	439,000 ST		599,978
(Manganese, Ferro, Low Carbon)	0 ST		0
(Manganese, Ferro, Medium Carbon)	0 ST		28,920
(Manganese, Ferro, Silicon)	0 ST		23,574
(Manganese, Metal, Electrolytic)	0 ST		14,172
Mercury	10,500 Flasks		191,391
Mica, Muscovite, Block, Stained & Better	6,200,000 LB		5,212,444
Mica, Muscovite Film, 1st & 2nd Qualities	90,000 LB		1,274,489
Mica, Muscovite Splittings	12,630,000 LB		19,035,147
Mica, Phlogopite Block	210,000 LB		130,745
Mica, Phlogopite Splittings	930,000 LB		1,704,097
Molybdenum Group	0		0
(Molybdenum Disulphide)	0		0
(Molybdenum, Ferro)	0		0
Nickel	200,000 ST Ni + Co		0
Opium Group	130,000 AmA LB		71,303
(Opium Gum)	0 AMA LB		31,795
(Opium, Salt)	130,000 AMA LB		39,508
Platinum Group Metals, Iridium	98,000 TrOz		16,991
Platinum Group Metals, Palladium	3,000,000 TrOz		1,255,003
Platinum Group Metals, Platinum	1,310,000 TrOz		452,640
Pyrethrum	500,000 LB		0
Quartz Crystals	600,000 LB		2,128,149
Quinidine	10,100,000 Av Oz		1,800,462
Quinine	4,500,000 Av Oz		3,246,164
Rubber	864,000 MT		120,508
Rutile	106,000 SDT		39,166
Sapphire & Ruby	0 KT		16,305,502
Silicon Carbide, Crude	29,000 ST		881,550
Silver (Fine)	0 TrOz		139,907,000
Talc, Steatite Block & Lump	28 ST		1,092
Tantalum Group	7,160,000 LB Ta Metal		2,391,940
(Tantalum Carbide Powder)	0 LB Ta		28,688
(Tantalum Metal)	0 LB Ta		201,133
(Tantalum Minerals)	8,600,000 LB Ta		2,551,302
Thorium Nitrate	600,000 LB		7,131,812
Tin	42,700 MT		201,535
Titanium Sponge	195,000 ST		32,331
Tungsten Group	50,666,000 LB W Metal		80,047,625
(Tungsten Carbide Powder)	2,000,000 LB W		2,032,942
(Tungsten, Ferro)	0 LB W		2,025,361
(Tungsten Metal Powder)	1,600,000 LB W		1,098,911
(Tungsten Ores & Concentrates)	55,450,000 LB W		87,062,763
Vanadium Group	8,700 ST V Metal		541
(Vanadium, Ferro)	1,000 ST V		0
(Vanadium Pentoxide)	7,700 ST V		541
Vegetable Tannin Extract, Chestnut	5,000 LT		16,393
Vegetable Tannin Extract, Quebracho	28,000 LT		140,810
Vegetable Tannin Extract, Wattle	15,000 LT		16,398
Zinc	1,425,000 ST		376,310

Source: FEMA

Question 2: How effective has the existing minerals attache program been? Are current deficiencies in the program primarily a result of inadequate expertise and training, or rather lack of adequate staffing and manpower?

Answer: Years ago there were several mineral attaches per se, but in more recent years they have been superseded by "Regional Resource Officers" (RROs), generally career Foreign Service Officers often with only limited or even no specific training in mineral science and/or technology. Consequently in many cases they are limited to relaying official reports from the countries which they cover and have difficulty in relating to mineral industry professionals or in making detailed on-the-spot investigations and analyses. Therefore, the Department of the Interior will facilitate new RROs spending some time in the U.S. Geological Survey and the U.S. Bureau of Mines, including inspection of field and industrial operations, before they take up their duties at foreign stations.

Question 3: The Report states that the Administration will seek increased and improved cooperation from the private sector in responding to minerals and materials data requests (page 20). What specific steps are being planned to achieve the increased and improved cooperation? Will this effort be entirely voluntary, or are mandatory requirements being considered? Will additional legislative authorities be required to carry out this program?

Answer: Much of the mineral data needed by the Federal Government is currently collected by the U.S. Bureau of Mines. The Bureau has cooperative agreements with almost every one of the fifty states, so as to eliminate duplicate collection. Bureau representatives regularly meet with professional societies and trade associations to discuss data needs of government and the mineral sector of the economy, and Bureau statistical canvasses are frequently revised to reflect new requirements. The Bureau recently held a special series of regional meetings with representatives of the mineral sector of the economy to discuss Bureau research and data collection. Further, the Bureau is revitalizing its State Liaison program to assure closer Federal-State cooperation and coordination. Data collection has long been voluntary in most instances, and the voluntary system has worked remarkably well because the mineral sector of the economy receives desired feedback from the Bureau on a regular basis in the form of monthly and/or quarterly statistical summaries, which include exports and imports, necessary for the orderly conduct of data suppliers' commercial operations. Some data is currently collected under mandatory authority provided by the Defense Production Act of 1950 as amended. As long as Federal involvement with the mineral sector of the economy continues at about present levels of activity there would appear to be no need for additional mandatory authority at this time. However, the Defense Production Act currently is scheduled to expire as of September 30, 1982, unless renewed. Administration representatives have testified repeatedly as to the need for a five-year extension of the basic Defense Production Act.

Question 4: The Administration proposes the possibility of creating a National Minerals Information Center. Where within the Federal Government would this Information Center be located? To what agency or department would it primarily be responsible? What powers would it have? What would be its relationship with other departments and agencies having minerals and materials data responsibilities?

Answer: Much of the mineral data is currently collected by Department of the Interior agencies including the U.S. Bureau of Mines, the U.S. Geological Survey, the Minerals Management Service, the Office of Surface Mining, and the Bureau of Land Management. However, it would be premature to state whether such a center should be established or where if established, it might be located. The Bureau of Mines has already completed an exhaustive inventory of mineral data collected by Federal Departments and Agencies and has published a directory listing the types of data collected by a broad spectrum of agencies. The Bureau of Mines also met recently with the Organization of American States to initiate more uniform collection and reporting of mineral data in the Western Hemisphere.

Question 5: According to the policy statement, minerals research is now being focused more on supply assurance, i.e., the development of domestic sub-economic deposits, and major process innovations. What implications might this have for other aspects of the policy, i.e., the use of Title III DPA, and stockpile purchases? Who is doing the analysis of the use of Title III DPA, and when will it be complete?

Answer: Under current stockpile planning each annual ton of new domestic productive capacity reduces stockpile requirements by three tons. Consequently, if research can show ways that presently sub-economic resources can be mined, concentrated, smelted, and/or refined more economically, such research could well lead to investment in new domestic facilities. A major thrust of this Administration is to encourage more domestic investment through the tax provisions, including those for increased research, in the Economic Recovery Tax Act of 1981. No single analysis of Title III can be made. Instead, analyses of the use of Title III must be done on a case-by-case basis for each material and project. Mineral projects will be assessed by the Department of the Interior and the Federal Emergency Management Agency (FEMA) working together as provided for in Executive Order 10480 issued under authority of the Defense Production Act. Because appropriations would have to be made to implement programs and/or projects under Title III, FEMA would submit budget justifications through normal channels for cases found to be more cost-effective than stockpile purchases.

[redacted boilerplate]

COMMITTEE ON SCIENCE AND TECHNOLOGY
U.S. HOUSE OF REPRESENTATIVES
WASHINGTON, D.C. 20515
(202) 225-6371

[redacted boilerplate]

May 6, 1982

Paul K Krueger

Mr. Paul [redacted] -
Federal Emergency
Management Agency
500 C Street, S.W.
Washington, D. C. 20472

Dear Mr. Kraus:

Thank you for your interest and concern for critical materials and the recent hearings held on this subject by our Subcommittee. Attached are a number of questions directly relevant to FEMA's responsibilities which I would ask that you answer for the hearing record.

Again, thank you for your help.

Sincerely,

Paul C. Maxwell
Science Consultant

PCM/mr
Attachment

QUESTIONS FOR FEMA

1. Why is aluminum listed as an item of shortage when it is readily available in the market? Is it a matter of having set an unrealistic goal or what?

2. Why aren't we attempting to fill the goals of the stockpile at a moment when aluminum, copper, and other commodity prices are depressed? Who makes the decision and why aren't we taking advantage of current market circumstances to fill the stockpiling goals?

3. Why don't we sell the surplus materials (about $5 billion worth) and use the proceeds in the purchase of other materials considered as necessary?

4. Is the Department of Defense seeking to establish a purchasing program for guayule rubber? What has happened to the FEMA proposal for a $200 million grant program to develop guayule?

Federal Emergency Management Agency
Washington, D.C. 20472

JUN 17 1982

Honorable Doug Walgren
Chairman, Subcommittee on Science,
Research and Technology
Committee on Science and Technology
House of Representatives
Washington, DC 20515

Dear Mr. Walgren:

This is in response to the letter from Dr. Paul Maxwell who transmitted four questions to our agency regarding the responsibilities of the Federal Emergency Management Agency in the area of critical materials. We understand that the answers will be included in the record of the oversight hearing on the National Materials and Minerals Policy R&D Act of 1980 and the consideration of H.R. 4281, the Critical Materials Act of 1981.

Thank you for the opportunity to participate in this hearing by including our answers for the record.

Sincerely,

Nadia K. McConnell
Director
Congressional Relations

Enclosure

QUESTION 1

QUESTION 1. Why is aluminum listed as an item of shortage when it is readily available in the market? Is it a matter of having set an unrealistic goal or what?

ANSWER: The goal for aluminum is realistic. Ready availability of aluminum in the current market situation does not affect the stockpile goal. Stockpile goals are based on statutory requirements contained in the Strategic and Critical Materials Stock Piling Act and on Presidential policy guidance as reaffirmed on April 5, 1982, in the National Materials and Minerals Policy statement. These guides call for projection of stockpile goals based on a war scenario and require the stockpile to be sufficient to meet the military, industrial and essential civilian needs of the Nation for the first 3 years of a war.

Aluminum is a strategic and critical material because of its importance to defense and industrial production and because the U.S. cannot satisfy its wartime requirements solely from domestic sources. Requirements for aluminum are substantially higher during wartime as compared with peacetime. The published stockpile shortage (deficit) represents the difference between estimated wartime requirements and available wartime supply, including stockpile inventory, as projected under the wartime scenario.

QUESTION 2

QUESTION 2. Why aren't we attempting to fill the goals of the stockpile at a moment when aluminum, copper, and other commodity prices are depressed? Who makes the decision and why aren't we taking advantage of current market circumstances to fill the stockpiling goals?

ANSWER: Stockpile purchases to fill goals of high priority items have been made of the following materials since fiscal year 1981 when the first major appropriation for stockpile purchases in over 20 years was passed: cobalt, Jamacian-type bauxite, iridium, opium salts, refractory bauxite, quinidine sulfate, and tantalum. Between fiscal years 1979 and 1982, the Administration requested a total of $635.5 million for stockpile purchases. Of that amount, the Congress appropriated only a total of $157.6 million. The Administration requested $120 million for stockpile purchases in the fiscal year 1983 budget.

FEMA establishes the acquisition priorities in accordance with the requirements of the Stock Piling Act and Presidential guidance. Decisions on proposed purchases (materials and quantities) are made through the interagency Annual Materials Plan Steering Committees, chaired by FEMA, with approval by the Armed Services Committees of the Congress. Through the appropriation process, Congress, together with the executive branch, makes the decision to purchase materials.

NP/RP/MR
5/20/82

QUESTION 3

QUESTION 3. Why don't we sell the surplus materials (about $5 billion worth) and use the proceeds in the purchase of other materials considered as necessary.

ANSWER: Surplus stockpile materials, for which congressional disposal authorization exists, are being sold as expeditiously as possible. The Stock Piling Act requires that sales be made in a manner that will avoid undue disruption of the usual markets of producers, processors, and consumers of the material and protect the United States against avoidable loss. Over 90 percent of the value of the stockpile excesses occur in just four materials: tin, tungsten, diamond stones and silver. Large and too rapid disposals of these items would disrupt markets and reduce the cash return to the Government. While congressional authorization exists to dispose of these materials, the Department of Defense Appropriation Act, Public Law 97-114, halts the sale of silver pending review of requirements, thus reducing potential proceeds available to purchase needed materials. All sales proceeds are placed in the National Defense Stockpile Transaction Fund, but appropriations are required before these monies can be used for stockpile purchases.

QUESTION 4

QUESTION 4. Is the Department of Defense seeking to establish a purchasing program for guayule rubber?

ANSWER: The Commerce Business Daily issue of April 21, 1982, carries a synopsis of a Department of Defense guayule rubber program (see attached). We defer to the Department of Defense for additional information on this project.

QUESTION: What has happened to the FEMA proposal for a $200 million grant program to develop guayule?

ANSWER: The Office of Management and Budget has stated that the funding of a FEMA guayule project would be inadvisable at this time. Any future plans by FEMA to fund domestic guayule development under the Defense Production Act of 1950, as amended, must be reevaluated to incorporate any new DOD initiatives to develop a capacity to produce guayule rubber. FEMA, DOD, and other interested agencies are discussing the roles each will be playing within any future DOD guayule program. FEMA, for example, is now working with DOD and the Department of Commerce to develop updated stockpile purchase specifications for guayule rubber that would conform to guayule rubber produced under an expanded DOD guayule program.

Attachment

Issue No. PSA-8066, April 21, 1982 COMMERCE BUSINESS DAILY

34 Nonmetallic Crude Materials

34 - DEVELOPMENT OF DOMESTIC GUAYULE RUBBER INDUSTRY - The Department of Defense is planning to solicit one or more sources to grow, harvest and process an amount of guayule rubber to be delivered for government testing. The DOD, through the authority of Title III of the Defense Production Act of 1950, is interested in assisting in the establishment of a domestic rubber industry. Specifically, there is a need for near term production of usable guayule rubber and by-products in sufficient quantity for evaluation and testing by the Department of Defense for potential military application. To this end, it is contemplated that a firm fixed price contract will be awarded for a quantity of guayule rubber to be delivered in 1985. As part of this contract, the Department of Defense plans to guarantee a loan to the contractor to aid in financing a portion of the effort. It is expected that the contractor will select and plant sufficient acreage of guayule at the earliest possible date, develop a refinement and production process and construct a pilot processing plant with production capacity of approximately 1500 LT per year by 1985. Information is being sought by the Government to determine an effective approach to accomplishing the above task. Interested firms with demonstrated capabilities and experience in this field should submit information, in accordance with note 68 within 10 days of publication of this notice. Previous applicable research and development findings would be welcome but company brochures or general information is not adequate nor desired. This is not a request for proposals. NAVAIR Synopsis 123-82 (106)
Naval Air Systems Command, (AIR-02E1), Washington, D.C. 20361

Copied from Commerce Business Daily
dated April 21, 1982

NP/RP/NR
5/20/82